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The State of the Grid

Obligations Met in Advance

WHILE the eleventh annual report of the Central Electricity Board contains, as its predecessors have done, much of technical interest, that aspect must take second place on the present occasion to the statement regarding the financial position at the end of 1938. This shows that, although the Board was statutorily required to pay from revenue the interest due on the £36¾ million expended for general purposes (*i.e.*, the construction of the grid itself) in 1942, it has been able to ante-date its obligation.

Consideration of the large amounts involved in the revenue account for general purposes (above £34 million from the sale of energy) indicates that a somewhat fortuitous addition of £75,000 due to additional demand charges in the "cold snap" last December did not appreciably affect the position. (For the arguments on the side of the Board we refer our readers to the review of the report which appears in this issue.)

This result has been achieved in a year in which the rate of increase, for the first time since trading began in 1933, has fallen below 10 per cent., but no doubt the Board owes a good deal to the consumption of energy having substantially exceeded its original estimates and also those of the Electricity Commissioners in planning the grid. The slackening in rate of advance last year need cause no apprehension, since it happened in all industrial countries, in some of which the output actually fell.

Large Industrial Loads

It should be said, however, that the policy of extending and reinforcing the grid where necessary to enable relatively small undertakings to give supplies to large steel and ironworks has conduced to this result, as have also the demands for electricity in industries engaged in rearmament, which are stated to depend for electricity mainly upon public sources. Much of the 200 miles or so added to the grid network last year was for such purposes.

Rearmament is not an unmixed blessing for electricity supply, as it has been responsible for delays in the commissioning of new generating units and has reduced the margin of spare plant to somewhat fine limits. It is good to learn, therefore, that as an insurance against shortage of plant 200,000 kW in excess of the amount included in the extension programmes for the next three years is to be installed in generating stations. New stations to be constructed at Barford and Ipswich will be of the three-boiler, two-turbine type like that projected for Stoke-on-Trent upon which we commented recently.

Outside the scope of the C.E.B.'s ordinary duties is the custody of switchgear, transformers and other equipment to replace apparatus that might be damaged in an air raid. The sum to be expended, £3,000,000, seems to be a high insurance premium for the first two items and it may be assumed that a wide interpretation will be placed, as it should be, on what constitutes "other equipment."

Lightning and Faults

Lightning, now that insulators are capable of standing up to fog and salt moisture and have a very much longer life than was expected only a few years ago, is the greatest cause of difference in reliability between overhead lines and underground cables. Great interest therefore attaches to investigations in hand, not only here but also in Nigeria.

Arcing grounds are another menace but the relief secured by means of arc-suppression (Petersen) coils on the 33-kV system has justified their extension. As a contribution towards more rapid clearance of faults, the introduction of 132-kV impulse-type single-break circuit-breakers with low oil content is especially notable within their limited field.

Closely associated with efficient switchgear operation the securing of high-speed selective protection and the excellent results achieved with the carrier-current system are gratifying, since rapidity in action is accompanied by an absence of risk of interference with other sections that has hitherto been obtainable only with the use of pilot cables.

The above observations relate to a few only of the developments in hand. Probably the most striking engineering feature has been the continued operation for many months of the nine areas of the grid as one system. The control of as much as 7,000,000 kW or so from one point has not, we believe, been carried out in any country before.

This has been made possible only through the co-ordination and reliable functioning of numberless details, large and small, that have all been supplied by British manufacturers. These form the solid basis of the Board's successful financial year.

Fixed Charge Basis

IT is nearly nine years since a Committee set up by the Electricity Commissioners urged that a domestic two-part tariff based upon the size of house should be adopted everywhere. This basis was chosen not because it was regarded as perfect, but because it was realised that it was better on all counts to secure a measure of uniformity than to wait until something ideal came from out of the blue. That still has not happened and things are where they were—or rather they are worse, since the McGowan Report introduced once more the note of indecision in referring to rateable value as well as size of house. No strong bias for any particular form of tariff was apparent during the discussion of the I.E.E. paper by Messrs. J. W. Beauchamp and R. Kauffmann, but there seemed to be general agreement that the present divergencies in tariff structure were prejudicial to electrical development. That being so a *prima facie* case is presented for the Commissioners to canalise and give effect to the views of the supply industry, as they are doing in regard to voltage standardisation. Tariffs are surely involved in questions of promoting the supply of electricity for which, as Mr. J. C. Dalton reminded us in his A.S.E.E. paper a fortnight ago, the Commission was set up. As things are there is not enough inducement, without strong official backing, for any supply engineer to invite the difficulties which would naturally occur as the result of making a change.

Notifying Failures

UNDER the Electricity Supply Regulations, 1937, undertakings are required to notify the Electricity Commissioners of "failures of supply." Hitherto this term has meant breakdowns affecting the whole of the undertaking, but from the beginning of this month its scope has been extended to cover all failures of bulk supplies (whether given or received) and of certain high-voltage supplies. The latter category comprises interruptions of at least one hour which affect transformers or convertors of 1,000 kW or more installed capacity and used for transformation to consumers' voltages and also those of any kind which last for more than twelve hours. The main object of obtaining such information should be the prevention of similar occurrences in other areas. Another advantage of including all really serious breakdowns under the official definition is that minor interruptions of low-voltage supply, mostly unpreventable and affecting few consumers, cannot be promoted to the status of "failures of supply" by interested parties. There is a precedent for this limitation in the Factory Act where an "accident" is regarded as an injury bad enough to incapacitate a man for over three days.

Refrigeration

THE review of refrigeration progress which we publish this week does not present a particularly rosy picture; but, on the whole, bearing in mind the lack of really hot weather last year and the freezing of money due to international uncertainty, that was to be expected. On page 489 Mr. H. C. Timewell presents the subject from the manufacturers' point of view. In particular, he cites as a bad policy the cutting of prices; but, while appreciating the high manufacturing and selling costs, we feel that no real progress will be made until refrigerator prices have been still further reduced, difficult though this may be. If we are to wait until the public can be educated to regard refrigeration as a necessity, we shall wait in vain. Much is said against the 2- and 3-cu. ft. sizes, but our experience is that increased sales of these sizes will do more than any amount of talk to make the public "refrigerator-minded." A minimum number of models and complete simplification to make the mass production of small models economical is a suggestion which we put forward for the serious consideration of the larger manufacturers. Our last word is to the supply companies, who feel that the refrigerator business is not worth while; they should remember that an electric refrigerator may introduce an electric cooker.

Film Propaganda

WE have always considered the cinema to be a first-class way of "putting over" a commercial idea to the public. That is if it is done properly; otherwise the effect is the opposite to that intended. Broadly, we think, there are three types of publicity films: those designed for the instruction of agents and dealers; those for selected audiences; and those meant for the general public. The most difficult to produce are the last. They must have entertainment value and the advertisement sting (if any) must be in the tail and not too sharp. It is easier to deal with a service than a particular commodity, and some of the "documentaries" which we have seen have been very effective. The films so far produced by E.D.A. have not quite got away from the commodity aspect of electricity. They are excellent for showing to selected audiences, but this, we fear, is largely preaching to the converted. The test of a film for exhibiting in a public cinema is whether it is good "box office." Such films have been made for other services, and we still hope to see one produced for electricity.

Rearmament and Exports

THE urgency of the Government's national defence programme is placing a heavy strain upon the engineering industry, and although it is only right that companies so engaged should give it preferential treatment over their recognised business, the importance of maintaining the output of their normal products, especially in the export market, must not be overlooked. Sir Felix Pole, chairman of Associated Electrical Industries, Ltd., in his speech at the annual meeting of the company, reported elsewhere in this issue, made it clear that his company was fully alive to the importance of the export market, and although their activities in connection with national defence made heavy calls upon their works, they had been so arranged as to interfere as little as possible with their normal production of electrical and allied products. He emphasised that they were anxious not to reduce in any degree their export trade.

Export Information

THE stressing by Sir Felix Pole of the vital importance of export trade to the electrical industry lends additional importance to a number of articles on overseas markets which we are publishing. These have been written by authorities on the spot to afford guidance to British electrical manufacturers as to the requirements of various Empire and foreign markets and methods of securing business. The first article appears on page 495. In this Mr. C. G. Abbey surveys the position in Canada and while not holding out extravagant hopes indicates what would-be exporters to the market must do. Australia will be dealt with in our April 21st issue by Mr. S. F. Ferguson, Director of the Australian Association of British Manufacturers.

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REFRIGERATION TRENDS

A Survey of the Present Position

By H. C. Timewell

THE sales of domestic refrigerators continue to expand despite the temporary setback in 1938 due primarily to the poor spring and summer. The demand for household refrigerators is still largely governed by climatic conditions. A burst of warm weather has an immediate reaction on sales; in fact, from experience one can plot daily sales and daily temperatures on the same chart to find that the two curves are coincident.

While this reliance on fine weather must be deplored because it results in the refrigerator business being so essentially seasonal, nevertheless it is not a characteristic peculiar to this country. Even in sub-tropical cities such as Rio de Janeiro, refrigerator sales follow this trend. With only a small variation between summer and winter temperatures, the Brazilian demand for domestic refrigerators falls off most noticeably during the winter months, which in England, would be regarded as propitious refrigerator weather. That same situation of seasonal fluctuations is also true of the United States.

Mr. H. C. Timewell is joint managing director of the International Refrigerator Co., Ltd.

Those people who have closely studied the question are convinced that the fundamental reason for the sharp decline after the summer holidays is due to psychological reasons on the part of potential purchasers. September, and even October, are frequently warmer months than April or May, while we are all familiar with the vagaries of our winter climate in producing sudden waves of warm sultry days. We know, too, that few owners of refrigerators switch them off in the winter. The overwhelming majority find that it is always summer time in the kitchen, consequently they need refrigeration service at all times of the year. The problem, therefore, resolves itself into a question of cleverly educating the public in the perennial necessity for refrigeration.

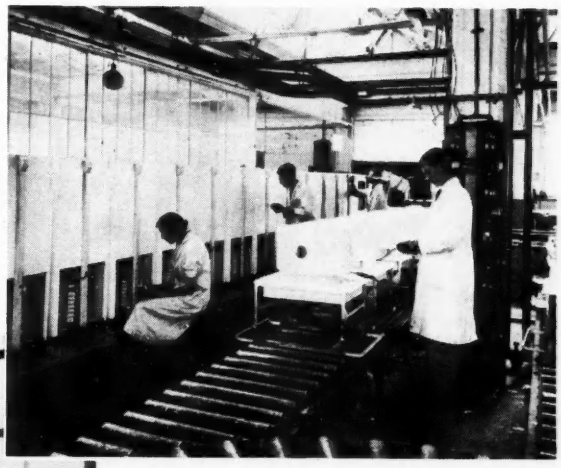
With the probable exceptions of the vacuum cleaner and the radio, it is doubtful whether any other electrical appliance has been so energetically and so enthusiastically merchandised as the electric refrigerator. The inevitable complaint levelled against refrigerator manufacturers is that their product is too high in price for really popular acceptance. At a dinner held recently, a well-known scientist and engineer made an ingenuous request for a reliable machine that could be retailed for ten pounds. He prophesied universal sales and great prosperity to the manufacturers.

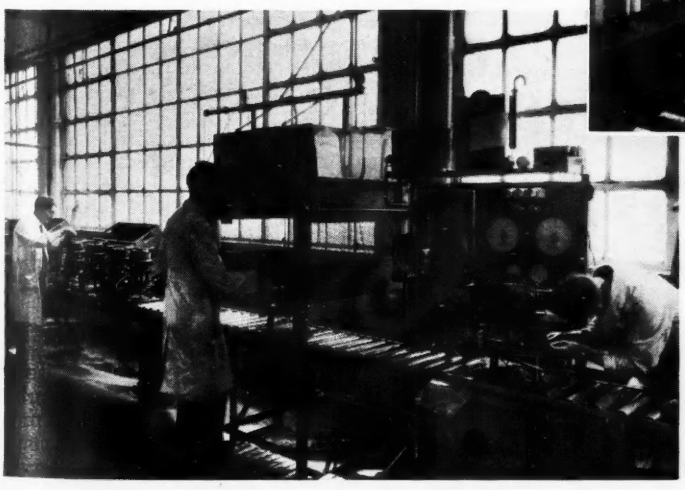
Such statements founded on abysmal ignorance of the true facts are unfortunate because they are so misleading, and are too often expressed by those people whose engineering and manufacturing knowledge should prevent them from uttering such erroneous statements. It is significant that even in the United States where annual production runs into hundreds of thousands, and with some twenty millions of domestic machines in use, that the American manufacturer has been wholly unable to list a refrigerator at ten pounds.

No British manufacturers or British distributors of imported machines have been successful in earning large profits. Many have lost a great deal of money. The reason for that situation is that the margins available between list prices and basic costs are too narrow. Selling costs as represented by trade discounts, advertising, commissions, salesmen, etc., are very high. Competition is so keen that prices have been forced down to uneconomic levels. Despite the fact that list prices have been halved during the past five years, costs have not been divided in two, and sales have not increased by over one hundred per cent. to justify those drastic reductions in prices.

Even if one were to assume that it was a practical engineering and manufacturing proposition to build a mechanical refrigerator which would last for at least five years for a factory cost of five or six pounds, it is debatable whether the manufacturer could sell a sufficient quantity to justify the initial tool investment and manufactured cost. We must remember that in spite of the introduction of attractive long term hire-purchase the sales of domestic refrigerators during the past three years have not exhibited any appreciable annual gain. Can we logically predict that a ten-pound refrigerator would lift sales from the present level of approximately 30,000 a year to, say, 500,000?

A domestic refrigerator is a very finely





Assembling and testing B.T.H. refrigerators

made piece of mechanism. It differs in many respects from other electrical appliances inasmuch as it is demanded that a refrigerator must perform its function of food preservation without any interruption in service and with the absolute minimum of mechanical servicing. Contrast that continuance of operation with a vacuum cleaner which is used for an hour or so a day, or a washing machine which is used for two hours a week.

In their endeavours to build a trouble-free mechanism, manufacturers have even designed and produced compressors which never need oiling and recharging of refrigerant after the original charging of the system at the factory. Parts are machined to tolerances more exacting than those permitted in the finest watches. And apart from the refrigerating unit, cabinets must be of pleasing appearance, durable, and well designed for food storage.

Costly Production Plant

Anyone familiar with the cost of presses, tools, dies and jigs will immediately appreciate the big initial investment needed to make the modern streamlined type of refrigerator cabinet. One manufacturer alone spent over £4,000 in tools and purchased a press costing over £15,000 to make his refrigerator cabinets.

The manufacturing side of the industry is constantly striving to improve its products in the deep rooted conviction that the refrigerator business in this country has now turned the corner after long profitless years of development. Wherever production economies can be effected without sacrificing the overall efficiency of the machine, then those savings will not only be made, but passed on to the ultimate purchaser.

I consider that it was a retrogressive step when most manufacturers decided to produce a 3 cu. ft. cabinet, as such a policy was so directly contrary to their tenet that a user must have at least 1.5 cu. ft. of storage space per person. The purpose of the refrigerator was to take the place of the larder. But, bowing partly to the demand for a cheap refrigerator, and partly to the exigencies of space in the modern kitchen, we have witnessed 2 cu. ft. machines launched successfully.

The gas companies pioneered similar-sized and even smaller cabinets, but why should we in the electrical industry follow in the footsteps of our greatest competitor? We are conversant with the pros and cons of electric *versus* gas refrigeration, and with our proven superiority, why should we not sell the public refrigeration service in every sense that those two words imply rather than hire-purchase terms and small space?

The most popular-sized cabinet sold in the United States in 1938 was the 6 cu. ft. model. Sales of "midget" refrigerators were less than 1 per cent. of the total number installed.

Refrigerators are neither a luxury article nor an article which has a direct appeal to the poorer classes. The typical sale is to a family who are in moderate or comfortable circumstances, who own a car and have a telephone installed, and whose income is above that line of demarcation where half a crown a week does not represent the difference between a dinner and no dinner. The typical buyer needs refrigeration service—not just a refrigerator. It is worthy of note that one progressive supply undertaking has decided to concentrate a large part of its forthcoming refrigerator activities in selling 5 cu. ft. cabinets in direct contrast to the general trend in other supply areas.

Supply Authorities' Sales

The sale of domestic refrigerators is getting more and more into the hands of electricity supply authorities. There are many reasons for this development. First and foremost, it is only correct that the largest single outlet for electrical appliances should include refrigerators in their sales campaigns. But the expansion in their refrigerator sales is due in no small measure to the impetus given by gas companies who originated the selling of refrigerators on easy terms.

To combat the energetic gas campaign it was essential to offer electric refrigerators on comparable terms, thereby indirectly assisting in the exclusion of gas cooking. As a direct result of the very favourable terms given for electric refrigerators supply authorities have been able to capture an increasingly larger share of the market.

The Contractors' Part

The electrical contractor, by and large, has not been able to compete with these terms, so that in those areas where the local authority or power company are vigorously fostering a refrigerator campaign, the contractor finds it increasingly difficult to sell the particular make for which he holds an agency against the make sold by the authority concerned. It seems a pity that this situation should have developed, because in its essentials it means that we have two major sales outlets in the electrical industry competing against each other, whereas they should both act in co-ordination. A few undertakings have displayed initiative in organising contractors and appointing them as selling agents with powers to sign up consumers on the special hire-purchase terms. It is far better for a supply authority to have all its local contractors selling for it than against it.

Commercial Refrigeration

Commercial refrigeration as exemplified in the automatic type of plant is a much more specialised business and one in which both distributors and manufacturers enjoy a greater margin of profit. Commercial refrigeration has to be engineered and sold by representatives who in their training and knowledge must be "Jacks-of-all-trades." They must talk meat to the butcher, fish to fishmonger, milk to the dairyman, ice-cream to the ice-cream vendor, fruit to the grower, beer to the brewer, and, in addition, they must be able to survey accurately industrial needs, hospital requirements, and a host of other applications.

In consequence, the sale of commercial refrigeration is usually effected direct by the manufacturers to the ultimate purchasers, or through specialised distributors. A few electricity undertakings have taken up the sale of commercial plant with success, but in every instance they have found it necessary to employ special staff experienced and trained in commercial refrigeration.

A Steadier Demand

This branch of the refrigerator industry is not subject to the same sharp seasonal fluctuations as domestic machines. Selling commercial refrigeration is essentially a matter of business—of profit and loss. A hotelier is just as good a prospect in the summer as he is in the winter. It is the common practice of the commercial man to buy and install his new plant prior to the warm weather, so that he will not have structural alterations taking place at an inconvenient time of the year.

Dairy farmers are ready to consider milk-cooling plants after their milk contracts are renewed in the early autumn; fruit growers place their orders for gas-tight refrigerated stores in the early months of the year; ice-cream manufacturers must have all their new plant in readiness for the Easter trade; while local government bodies, hospitals, institutions, industries, railway companies, and others are in the market at all times of the year.

As a part of educating the public in the need for refrigeration it cannot be too strongly emphasised that the economic development and existence of the British Empire is largely due to refrigeration. Over 50 per cent. of the meat consumed in the British Isles is imported. Each family spends approximately 12s. a week on food brought from other countries.

The refrigerator business is a virile one, despite its handicaps. It is a sound business in its sense of public responsibility and service. It could be made more profitable to all concerned through a greater measure of understanding of the fundamental problems and a deeper realisation of the immediate need for the active co-operation of all sections of the electrical industry.

REFRIGERATOR SALES

Conditions and New Equipment Reviewed

LAST year was not a very successful year for refrigerator manufacturers, despite the intensive publicity campaign which was conducted by E.D.A. and the various supply undertakings in co-operation with manufacturers.

During the past two years a growing proportion of sales has been handled by supply undertakings, a fact which many dealers regard as a threat to their own sales. This, at the moment, is a matter of controversy, but there is no doubt that the supply undertakings' activities have played an important part in bringing about a reduction in the price of the apparatus.

In this country refrigerator sales are influenced not by kitchen temperatures but very strikingly by weather, and during last year there were no marked high outdoor temperatures. To this fact, and the unsettled feeling generally, we believe, can largely be attributed the decline in sales. This year no major refrigeration campaign is being launched.

Hire-purchase rates upon five-year terms are generally available; in many cases they are offered by dealers as well as through supply authorities, to whom must be given the credit of initiating the idea, as the manufacturers now have their own hire-purchase schemes.

The most popular sizes remain the 3- and 5-cu. ft. models and, as an example of terms, we quote the County of London Company's rates of 2s. and 2s. 9d. respectively per week for five years with free maintenance, a plan typical of those of the more progressive supply undertakings. Where a 3-cu. ft. model is purchased through a dealer under the manufacturers' terms the cost to the customer is likely to work out at from 2s. 6d. per week.

In West Ham, where 70 per cent. of the houses are of under £15 rateable value, the 3/4 cu. ft. size is marketed at 2s. 3d. a week, but in such a district where prospective customers have to be picked out, Mr. Townley finds direct mail advertising superior to press and poster publicity. The Northmet Co. is offering this year eleven models by three manufacturers with hire-purchase terms from 2s. 2d. per week. Posters and press advertising are being employed and 120,000 "prospects" are being approached by post. At Hammersmith an unusually large refrigerator—actually nearly 4 cu. ft.—can be obtained on the five-year hire-purchase plan at 2s. 6d. per week.

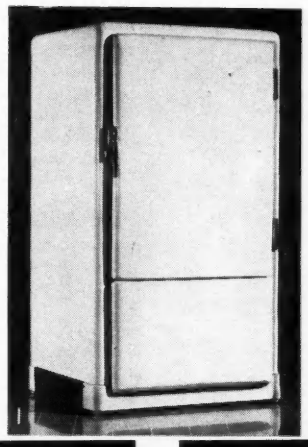
No special campaign is being conducted by the Electrical Development Association this year, but posters and publicity material will be available in the usual way.

It is, indeed, unfortunate that the supply undertakings' campaigns of the last two years should have met with such a poor response, for it has led to a belief that the undertakings have spoilt the market for the dealers. But the results are, we feel, due rather to a combination of adverse circumstances. It is one thing to talk of what has been done in America and quite another to expect the same in this country. Many people, including the manufacturers themselves, have laboured under this delusion.

Apart from the essential climatic conditions, there is practically no place in England where goods cannot be delivered fresh each day by the local store; again, we have a limited number of families with incomes high enough to warrant the purchase of a refrigerator, yet there are, or were last year, about thirty different makes — say, 150 different models—to choose from. A situation like this necessarily precludes economical mass production and low prices, which, to complete the vicious circle, again militates against large-scale sales.

A good deal is to be said for the built-in refrigerator, and every effort should be made to educate builders in this matter. In this field the supply authority is, however, likely to be more than usually interested, more perhaps than the manufacturers, for, even where a builder may consider a refrigerator a good selling attraction for his flats or houses, the price he will accept is likely to be a keen one. But a block of a hundred or so flats would present quite an acceptable constant load—say, 100 kWh a day.

A "County Company" poster



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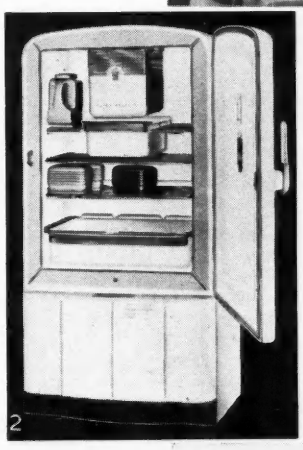

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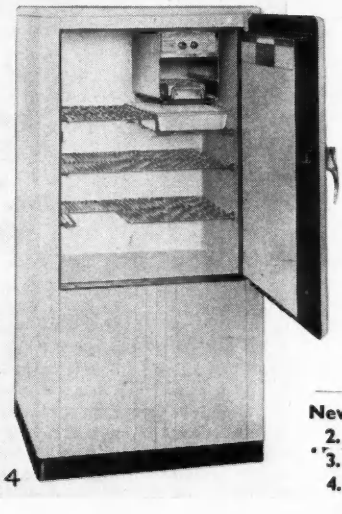

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Design Developments

So far as equipment is concerned there are few radical changes, and quite a number of manufacturers are retaining 1938 models.

The 2 cu. ft. size has come to stay, but the once-favoured idea of the lift-up lid, appears to have given way to the orthodox front door opening.

The fall in prices has come to a halt and in some cases there have been increases, but there is remarkably good value to be had at the lower end of the scale. There are 2¼ cu. ft. models at 24gn., 3¼ cu. ft. at £26 5s., and a 3½ cu. ft. size at 27gn., while one manufacturer is selling a 4 cu. ft. refrigerator at 28gn. There is even one 4½ cu. ft. machine which is retailed at 26gn.

One of the widest ranges of refrigerators offered is that of the International Refrigerator Co., Ltd., which has twelve models rated at from 3½ to 16.1 cu. ft. The characteristic external "monitor top" housing the hermetically sealed compressor has practically disappeared, except for model GL48, its place being taken by a concealed unit housed under the food cabinet.

This conforms with general practice today, as there are now very few compressors mounted above the food cabinet. Having the compressor below raises the cabinet to a convenient working height without mounting the whole machine on

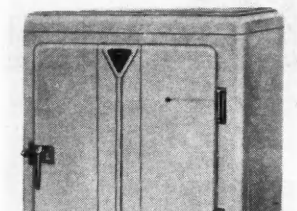
New refrigerators: 1. Coldspot "Underfour"
2. "Westinghouse" JA.62
3. A. J. Balcombe "Shelvador BH" series
4. 3 cu. ft. "Coldair"

legs, or making the top undesirably high, while the high standard of modern insulation has overcome trouble from heat losses from the motor.

The B.T.H. "PB" series is a particularly attractive design, and is supplied with a neat storage drawer, vegetable container and fruit drawer as well as a pleasingly designed selection of pottery utensils. "Mufflers" and internal springing give quiet operation of the compressor. Another new range, somewhat similar in general design but without porcelain exterior finish, is the "B" series made in 4 and 6 cu. ft. sizes.

A new "Flexefect" suspended unit has been incorporated in the Marco refrigerators, all of which are new. The two smaller units of 3 and 3½ cu. ft. in particular have been improved.

There are three new models in the Kelvinator range, the BU25, 35, 45 and 55. The first two are 2½ and 3 cu. ft. models, greatly improved versions of an earlier type, with clean, simple rounded lines, all external ledges having been eliminated. The door now occupies the whole of the front panel concealing the division between the compressor compartments and cabinet. The shelf area and bottle space are increased and the ice-freezing capacity trebled. "Dulax" enamel is the external finish, and the shelves are supported on rubber. The BU45 and 55 are larger "economy" models of simple but attractive construction with shelf areas of 10½ and 12¾ sq. ft. respectively. Both have a vegetable crisper and the larger also a "utility basket."



The new 2½ cu. ft. "Prestcold"

Model TUD.354 has been improved by the addition of a vegetable drawer and an automatic interior light and model TUD.440 by the addition of the vegetable drawer. Other models are the same as last year.

One of the most interesting and original designs has been developed by the Express Refrigerating Co., Ltd. This company has now dropped completely the ordinary type of domestic refrigerator and is concentrating entirely on the "Multifrige," a unique combination of refrigerating cabinet and cooled larder. The cabinet is divided into three portions. The top part can be kept at a temperature of 30 deg. and contains the evaporator, the lower cabinet at 40 deg., and the side cabinet at 50 deg. Four models give a net capacity of 14 cu. ft. (20 sq. ft. shelves), 10, 8 and 6 cu. ft.

Differential Treatment

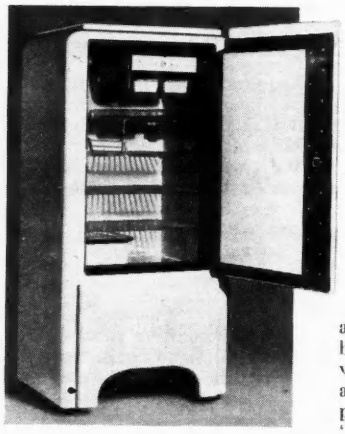
It is pointed out that there is a very real advantage in this form of construction where different kinds of foodstuffs have to be stored. Fish, for instance, demands a low temperature, vegetables and fruit need medium moist cold air to keep them at their best, while still another set of conditions is required for the storage of dairy produce and meat.

A new 2½ cu. ft. refrigerator has been added by the Pressed Steel Co., to its range of "Prestcold" refrigerators. It has eight freezing speeds, a porcelain interior and an ice-tray release.

Another newcomer is the "Coldspot Underfour," of Sears Roebuck & Co. Despite its low price there is a food storage capacity of 4 cu. ft., a shelf area of 7.15 sq. ft., and an ice-making capacity of 5 lb. The rotary compressor is situated under the cabinet in this case, but the rest of the "Coldspot" range has it above the cabinet. These have an extra storage drawer provided below the cabinet.

There are six "Westinghouse" models in the Lightfoot Refrigeration Co.'s range, from 3½ cu. ft. capacity. The larger sizes have pottery utensils—a water server, butter dish, &c. Forced draught is employed with the hermetically sealed unit, and an automatic overload cut-out is also incorporated.

In the new "Coldair" model of the General Electric Co., Ltd., special consideration has been given to providing a large storage space with a small floor area. The 3½ cu. ft. size takes up a space only 45⅜ in. by 21½ in. wide by 21⅞ in. deep. The three shelves have an area of 6.9 sq. ft. and the single ice tray makes eighteen ice cubes in one batch, and an additional tray can be added. Another new model is the 5.8 cu. ft. size, which measures 52 in. high by 25¼ in. wide by 22⅝ in. deep. The shelf area is 9.7 sq. ft. and the four ice trays make 72 cubes at a time.



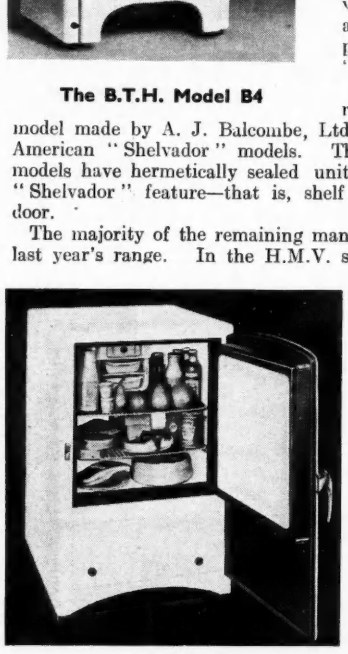
The B.T.H. Model B4

An ice tray has been added and a door fitted to the freezer of the Frigidaire "Master 3," as the *de luxe* model has been discontinued. The rest of the company's series remain unchanged.

The extraordinarily low-priced 4½ cu. ft. refrigerator of the Century Refrigeration Co. is being continued, and a 3½ cu. ft. size has been added to the range which now includes a 6- and 8-cu. ft. size. Low price characterises all the "Century" machines.

The "Alba" 3½ cu. ft. refrigerator is a British model made by A. J. Balcombe, Ltd., who also market the American "Shelvador" models. The "BH" and "DH" models have hermetically sealed units and the well-known "Shelvador" feature—that is, shelf accommodation in the door.

The majority of the remaining manufacturers are retaining last year's range. In the H.M.V. series, unchanged, is an interesting "Economy" series, simply constructed at the lowest price compatible with reliability and pleasing exterior design. The smooth rounded exterior surface of the H.M.V. refrigerators is one of their most attractive features—they were, in fact, one of the first to adopt this modern style. Now, however, it is pleasing to note that the sharp edges and dust collecting ledges, prevalent in many of the refrigerators on the market a few years ago, are fast disappearing.



The "Kelvinator" BU. 35

The Sparton Refrigerating Co., Vactric, Ltd., Orme Evans & Co., L. G. Hawkins & Co., Rotapex, Moffats, and the Coventry Refrigerator Co. are running last year's models unchanged. British Supercold, Ltd., have obtained the agency for Montgomery-Ward refrigerators, and Commercial and Domestic Equipment, Ltd., are now handling the "Stewart-Warner" refrigerators.

Now that change in refrigerator design is often a question of detail, or merely a selling point, there seems to be a very strong argument in favour of continuing the past year's models almost unchanged. After a year such as 1938 prior-year stocks are apt to be high, and money is lost both by manufacturer and dealer through the necessity of bringing out something new. Some form of stabilisation may well prove a move towards the very necessary lowering of prices.

The Situation in America

It is, perhaps, appropriate here to mention also developments in the United States. The Consolidated Edison Company of New York has announced the participation of thirteen manufacturers in a campaign for electric refrigeration between March 20th and July 31st, and it is estimated that during this period sales to the value of ten million dollars will be made.

The American utility companies are going to spend $350,000 in advertising over the period of the campaign. 1938, it appears, was also a bad year for refrigeration in the States, and at a recent convention of the Nash-Kelvinator concern the president called attention to the fact that dealers can now begin to tap a replacement market estimated at four million refrigerators.

Two interesting installations of off-peak cooling were carried out during the year according to the *General Electric Review* (U.S.A.). In one case the storage of cold enabled a 200-HP installation to be used instead of 330 HP, the equipment being operated during the power station's off-peak hours.

COTTON MILL LIGHTING

Experience of the Blackburn Undertaking

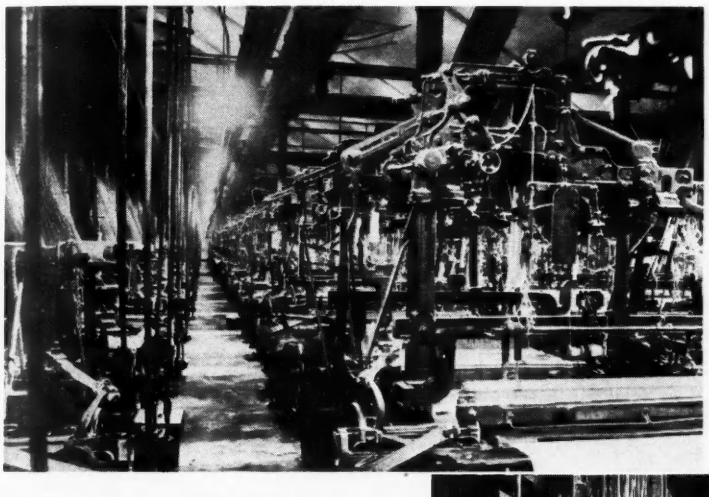
By R. H. Harral, A.M.I.E.E.

THE problem of selling electricity to the textile industry in a cotton town such as Blackburn is one demanding a full knowledge of the economic background of Lancashire's chief industry.

People are accustomed to regard the cotton industry as a depressed one, but few outside the trade itself appreciate just how depressed it is and has been for many years. Dozens of mills are permanently shut down. Some are dismantled and those remaining in business have had to face the task of drastic reorganisation and consequent demands for new capital. Even so, the problem of meeting subsidised foreign competition is a heartbreaking task from which there is little relief. All these factors are to be kept in mind when considering schemes for selling electricity for lighting or any other purpose to cotton-mill owners.

In Blackburn most of the mills were built a long time ago, and the methods of lighting are out-of-date and inefficient. It was realised that a large field for development existed, provided it could be demonstrated that good lighting meant increased efficiency and that, moreover, the costs involved in providing the new installations could be kept within a reasonable figure.

The whole problem was thoroughly examined, both with regard to providing cheap and efficient lighting installations and to the equally important question of a planned organisation for selling the idea of better mill lighting to prospective users. It was realised that however good the schemes for specialised lighting might be, unless they could be shown to the user in a way he could appreciate and understand, it would not be possible to market the idea at all.



Typical weaving sheds lighted by small dispersive reflectors

Contact is first established with the mill-owner or his executive through the usual channels—by sales letters and literature; direct approach by a member of the undertaking's staff; or, perhaps, an inquiry from the owner himself.

Following the preliminary discussion in which the general question of the effects of good lighting on production and efficiency is stressed, an offer is made to carry out a test on the existing lighting installation and provide a report free of cost and without obligation. At the same time the suggestion is put forward that in addition to the test of the existing lighting conditions, a demonstration of correct lighting should also be given and the comparative results checked together. Usually there is little difficulty in obtaining consent for the test and demonstration to be carried out, as the owner is generally well aware that his existing lighting conditions are not all they should be.

The next step is to make a careful survey of the mill and the existing lighting conditions, and it is important that every aspect and requirement of the particular industrial process under review should be studied in order that the correct recommendations for relighting can be made.

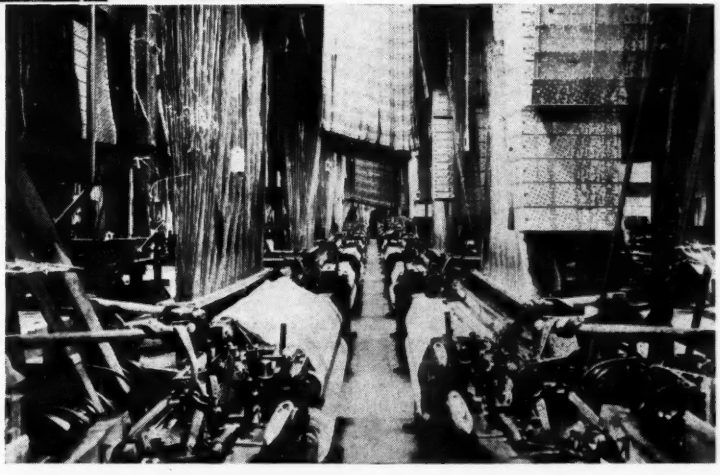
Mr. Harral is engineer and manager of the Blackburn electricity undertaking

Every lighting problem is treated on its merits. A machine layout drawings is obtained, or made, and the positions of the existing lighting fittings in relation to the process machinery carefully plotted out, together with photometer readings. To assist the investigation, photographs are sometimes taken of the existing lighting conditions for comparison and record purposes.

At the owner's discretion a section of the mill is chosen for the purpose of demonstrating the methods of lighting recommended as being best suited to his requirements. Experimental lighting points are then installed in approximately correct positions with provision for adjustment. In this connection, it should be mentioned that the temporary installations are usually wired in tough rubber cables, with shock-proof lampholders, care being taken to render the wiring safe.

Following the installation of the experimental lights, arrangements are made for a test to be carried out in the presence of the owner or his executives. Normally this takes place during the evening when the mill is closed down, and many tests have been carried out at nearly midnight during the summer months.

To facilitate the test, it is usual to invite the presence of an actual mill operative to ensure that the recommended lighting arrangements are criticised by a representative of the people who are to use the lights, and this has been found to be most helpful from both points of view. In order that the demonstration shall be self-evident, a photometer test is first applied to a section of the existing lighting and this is followed by a test on the experimental section. Usually the comparison serves to lend emphasis to the superiority of planned lighting, and provides an obvious and irrefutable argument in favour of the value of good lighting.



Naturally, the success or failure of the test depends on the results obtained in the experimental section. It is not uncommon to find that the newly aroused enthusiasm of the mill-owner leads him to be an exacting critic, and only the best will satisfy him. Various arrangements of group lighting are tried and tested by the practical operative for working efficiency, and many thorny problems have to be tackled, particularly in weaving sheds where Jacquard looms are used. The card gear and overhead " harness " of these looms leave little room to arrange group or parallel lighting.

It is usual, even when an arrangement has been finally agreed, to leave the experimental lights in position for a few days in order to anticipate any possible defect that may be found as a result of practical experience under normal working conditions.

Finally, a complete scheme is submitted containing recommendations for re-lighting, based on the data collected as a result of the test and demonstration. A good deal of care is given to the method used in submitting the scheme, as it is believed that the good impression created by the test and demonstration can be discounted by the presentation of a haphazard and loosely prepared scheme.

The scheme submitted is a comprehensive one, containing details of the test, full particulars of the arangements for relighting and a specification and estimate of costs involved in connection with the new installation, together with a layout drawing showing the positions of the lights and switchboards and all the particulars necessary to a proper understanding of the scheme.

Lancashire "tacklers" working in good artificial lighting

Every lighting problem is treated on its merits, and during the past few years a good deal of useful experience in factory and mill lighting has been gained. All classes of installations have been tackled in various sections of the cotton trade—carding, spinning, winding, weaving and the incidental preparation departments—and it has been invariably found that most problems involved in the preparation of general lighting schemes can be solved by the use of properly designed dispersive reflector type fittings.

A special word of praise is due to the smaller 11-in. 60/100-W size dispersive reflector. Thousands of this type of reflector have been used in Blackburn weaving sheds. They are particularly adapted to sheds using Jacquard looms and where there is very little headroom.

Some idea of the excellence of the light value obtained and the difficulties to be overcome, can be obtained from the illustrations. The average light intensity obtained is between 8 and 10 ft.-candles; 100-W lamps are in use and the mounting height of the fittings is 8 ft., arranged at 10 ft. centres.

The Economic Aspect

By a curious anomaly it is sometimes assumed that bad mill lighting must be tolerated because it is cheap, and good lighting, though very convenient and nice, must necessarily be a luxury that cannot be afforded. That this assumption is an erroneous one is beyond dispute. Apart from the very definite economies to be effected in connection with costs of manufacture that are evident in increased production, improved quality of goods produced, and the better all-round working conditions there is no reason why the pro-rata costs for lighting by electricity should be greater than by other means of lighting, particularly where it is possible to apply a suitable two-part tariff.

It should also be noted that there are other incidental items of cost that must be taken into account with illuminants other than electricity. Gas mantles, for instance, can be a very expensive item in a cotton mill. In addition to the usual breakages, which are unavoidably heavy, it is usually necessary to re-mantle gas installations at the beginning of each lighting season. In a number of cases within my experience an actual saving in lighting costs has been effected, disregarding the other economies referred to.

A good deal of attention has been focused on the question of factory and workshop lighting by the operation of the 1937 Factory Act, and there is no doubt that the very definite terms used in the lighting clauses of the Act have had the effect of stimulating the interest of factory owners, and while rather elaborate stress is laid on the fact that no particular type of illuminant is prescribed, it is obvious that to obtain the standard required electricity must be the medium used.

It should be noted, however, that inspectors are likely to be severely critical of electrical installations that do not measure up to the required standard, and it must be admitted that many installations are very bad examples of what is called the science of lighting. The incentive and publicity created by the new Factory Act provide a fine opportunity for the development of planned lighting in factory and workshop that ought not to be missed.

Arising out of the question of factory and mill lighting there are a number of important points that can be dealt with briefly.

For instance, it is very important in planning factory and mill lighting to have regard to the effects of vibration from belt-driven shafting. It is a fact that in many mills very few lamps burn out in the ordinary way, but fail due to the fracturing of the filaments caused by the constant vibration.

It has been found from experience that the best means of dealing with the problem is to ascertain where the severity of the vibration is most felt, which is generally along the line of the main shafting, and to erect anti-vibration devices. In Blackburn ordinary E.L.M.A. coiléd-coil filament lamps are used successfully throughout cotton mill installations.

It is preferable to arrange branch switching in groups not exceeding six lights. If the ganged switches are erected at suitable points the lighting installation becomes very flexible, there is no necessity for elaborate pilot lighting, and it is possible for small sections to be switched on as required. This is a convenience much appreciated when it is necessary to light sections of the mill for any purpose, such as preparatory work that must be executed during the evening when the mill is stopped or during periods of temporary darkness in the daytime, particularly in summer when any other method of lighting would be out of commission.

Ease and Convenience

It should be remembered that electricity is the only form of lighting available on demand. By simply closing a few switches light is obtained where it is required, without the necessity of starting-up compression or sending round lighters with tapers.

In a number of mills where electric lighting is not available it is often considered not worth while attempting to provide light during an emergency or on dull days, where only sections of the mill need light, and operatives are faced with the alternative of working for periods in semi-darkness or going home.

The effects of dust and dirt on the efficiency of lighting fittings has been emphasised many times and cannot be exaggerated in the case of cotton mills. The best way of dealing with this problem is to persuade the mill owner to include cleaning of lighting fittings in the weekly schedule of general cleaning.

To summarise, careful planning and attention to detail has resulted in encouraging progress being made in the development of electricity for mill lighting in Blackburn. Many difficult problems have had to be overcome, particularly with regard to costs, but it has been found that most problems are capable of solution by the joint effects of adaptation and a progressive policy.

Terminal Markings

A RECENT B.S.S. publication brings together for the first time in one document the latest proposals for terminal markings for a very wide variety of electrical machinery and apparatus, including supply lines, generators, motors, convertors, transformers, switchgear and instruments.

The immediate adoption by manufacturers of these terminal markings might in some cases conflict with the present practice, and they are therefore put forward as recommendations rather than as definite standards. It is to be noted, however, that in some cases the markings are to be regarded as definite specifications.

Copies of this publication (B.S. No. 822-1938) can be obtained from the British Standards Institution, 28, Victoria Street, London, S.W.1, price 7s. 6d. (by post 8s.).

A CANADIAN SURVEY

Recent Electrical Progress, with Notes on Plant Requirements

By C. G. Abbey

IN Canada the year 1938 witnessed a somewhat severe setback in business activities from the previous year, this being a natural consequence of the sharp recession in the United States in the latter part of 1937 which continued in 1938. The last few months of the year gave promise of a return to the higher levels of early 1937, but, although the actual figures are not yet available, general opinion seems to be that the year closed with a general falling off of business.

Trade revival was unquestionably retarded by the lack of confidence due to European conditions. Canada's sudden appearance in a major way into the aircraft industry, together with large orders for munitions placed with Canadian factories, are now playing a great part in the brightened outlook.

The author, who is president of Bepco Canada, Ltd., reviews the remarkable electrical development in the Dominion in the past few years. He also gives some guidance to British manufacturers contemplating entry to the Canadian market.

The continued advance in Canadian electrical development is reflected in the progress made by the electricity commissions of the various provinces. It was under their supervision that practically the entire new water-power developments in 1938, totalling 135,459 horse-power, were carried out.

The completion of this programme will bring the country's total water-power development to 8,190,772 HP. This actually represents only 18 per cent. of the Dominion's available water-power resources, and is largely centred in the two more highly industrialised provinces of Quebec and Ontario. Canada is now the world's second largest producer of electricity per capita with a figure of 2,455 kWh against Norway's 2,759 kWh.

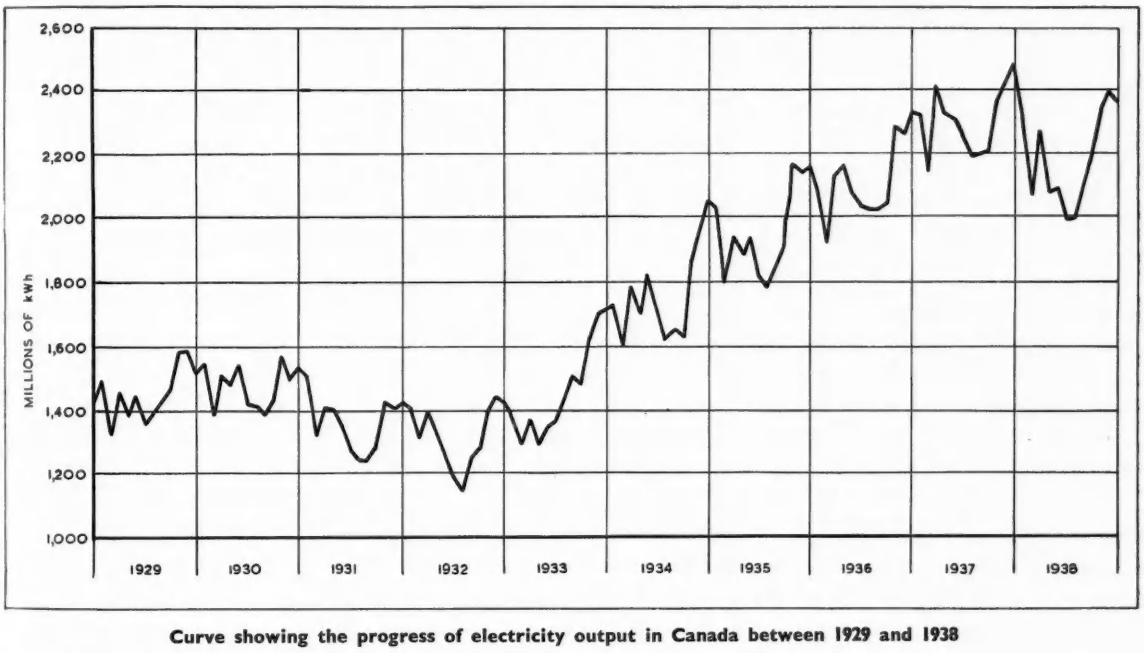
The Province of Quebec leads the world in per capita HP developed from water-power resources, the figure being 1.275 for Quebec as compared with 1.030 for Norway and 0.680 for Switzerland.

The Quebec National Electricity Syndicate has placed contracts for the construction of a 28,000-HP hydro-electric development, principally to serve the mining districts in Northern Quebec, and a 53,000-HP unit is to be added to the existing eight units at the Beauharnois Light, Heat and Power Co., Ltd., on the St. Lawrence River.

During the past two or three years there has been an extraordinary growth of power service in the rural districts of Ontario, at the present time there being approximately 15,800 miles of rural lines serving customers in nearly 500 different municipalities. Other provinces likewise have been extending service to the outlying districts, the Province of New Brunswick having constructed approximately 252 miles of rural lines during 1938 with a programme to install a further 200 miles during this year.

Provision made by the various electricity commissions for the extension of rural distribution lines has resulted in a great expansion of power service, particularly to the mining towns. During the year 1938 the Hydro-Electric Power Commission of Ontario approved the construction of 2,660 miles of new lines, a few of which will not be completed until some time this year. This figure of 2,660 miles shows a very marked increase above the 2,300 miles approved in 1937 and 1,894 approved in 1930. In Nova Scotia the Rural Electrification Act, which provides for provincial aid in rural line construction, resulted in the completion of some 325 miles of new rural lines during 1938.

The inauguration of the Trans-Canada Air Line has established new channels for a specialised line of electrical equipment, mainly for airport application. The public utility commissions in cities throughout the Dominion have taken steps to improve highway lighting and the modernisation of existing power equipment serving cities. These and similar examples are all indicative of Canada's advancement in diversified electrical fields in the past year.



Curve showing the progress of electricity output in Canada between 1929 and 1938

At the present time there are, actually, few large undertakings in hand. Among the more important is the 243,000-HP development of the St. Maurice Power Corporation, Ltd., at La Tuque, P.Q., where in March, 1938, the Shawinigan Engineering Company commenced construction of the dam at the foot of La Tuque Falls on the St. Maurice River. This dam will be a gravity type concrete structure about 1,100 ft. long with a normal head of 104 ft.

Orders have already been placed for the first four 40,500-HP turbines and generators, delivery to be made early in 1940 and the entire project is expected to be completed by January 1st, 1941.

Power consumption has doubled in the past decade, the accompanying curve showing the Canadian central station output for this period. While it will be noted that the year 1938 shows a decline from the peak year 1937, practically all of this decrease was secondary power for electric boilers which dropped to the extent of approximately 26 per cent. during the year.

The British Columbia Power Corporation has just completed an extension to its Ruskin station in the form of a second 47,000-HP unit. The Hydro-Electric Power Commission of Ontario has added to the Georgian Bay system a new station on Musquash River, having a capacity of 10,400 HP. Other projects recently completed include the Great Lakes Power Company's 10,000-HP station on the Montreal River in Ontario and the Nova Scotia Power Commission's 10,200-HP station at Cowie Falls on the Mersey River.

The most important recent installation in Quebec was the addition by the Gatineau Power Co. of a 34,000-HP unit to its Chelsea plant. These are the more important of the developments completed in 1938, although there are several smaller installations, bringing the new water-power capacity added in 1938 to an aggregate of 135,459 HP, as mentioned above.

Imports and Manufacturing

Owing to the comparatively small population of Canada, the limited market has hindered the formation and establishment of general industrial plants, and has resulted in many factories being started as branches of parent firms outside the country. In such cases the parent firm is usually well known, enabling the product to be put on the market immediately, and all engineering is done from the head office, thus removing this overhead from the Canadian factory and allowing it to operate profitably in the limited market.

It will be seen that a great number of Canadian manufacturing firms are, therefore, really only branches of parent houses across the border, or are otherwise controlled by or affiliated to American firms. A smaller number of firms is similarly controlled from the United Kingdom.

According to an estimate by the Dominion Bureau of Statistics there were in Canada at the end of 1936 2,132 companies (excluding steam railway companies and insurance companies) which were branches of, affiliated with, or controlled by companies incorporated out of Canada, these Canadian companies representing a total investment of $2,498,296,200 in the following proportion of ownership:—United States, $1,625,848,300; Canada, $491,029,400; United Kingdom, $346,543,000; and other countries, $34,875,500.

The following table shows the distribution of ownership in millions of dollars by the above-mentioned countries in respect of certain kinds of business:—

	Canada.	U.S.A.	U.K.	Other Countries.
Manufacturing ...	152.7	834.2	161.7	3.0
Mining	103.9	277.2	66.9	4.3
Utility	181.7	277.0	8.7	3.3

From the above figures it will be appreciated that it is only natural to find that the Canadian factories look to their American owners for engineering guidance and instruction on their purchasing as well as other matters. This makes it difficult for British manufacturers, relatively unknown in the U.S.A., to compete with Canadian manufacturers who are subsidiaries of United States firms, as the Canadian product is sold under the same familiar name and trade-mark used in the United States. The Canadian product is also to the American specification and dimensions, and so exactly meets the requirements called for on the engineering drawings often produced for a Canadian factory by its parent company across the border.

A still further difficulty confronting British firms meeting the Canadian market is the feeling of "good will" growing stronger each year between Canada and the United States, especially in the face of European turmoil. The recent trade agreement effected between the two countries, and the tariff adjustment making for reduced Canadian import duties on electrical equipment from the United States since January 1st, all have a considerable influence.

Methods of Doing Business

The British manufacturer seeking a market for his goods in Canada must come to a full realisation of the obstacles with which he is confronted. British manufacturers have always suffered from the lack of a complete understanding of the North American means of power distribution, power sites, the rules and by-laws of the provincial electricity commissions, and Canadian and American standardisation methods.

One example of the latter is the N.E.M.A. standardisation of induction motor dimensions covering motors up to 75 HP. This standard fixes all dimensions such as mounting holes, shaft height and size, &c., and numerous firms now will only purchase N.E.M.A. standard motors so that they will always be interchangeable. All leading American and Canadian manufacturers of motors now work to these standards.

It is not to be expected that engineers visiting the site of a proposed installation for the express purpose of securing information about the job can successfully meet the competition of those long conversant with existing conditions, and already British firms have accepted orders on the foregoing basis only to experience losses in the long run.

The only way a British manufacturer can hope to overcome this difficulty is by establishing his own branch house or permanent representative on the ground, whereby he can both study conditions and render the same service as his Canadian competitors. Only close cultivation of the market in this way will procure a permanent satisfactory business connection. It is detrimental to British engineering business generally for British companies to take orders from Canada without being fully conversant with all the conditions and fail to give adequate service when called upon.

As an example of the difficulty in servicing equipment a recent experience in connection with two British electrically driven pump sets may be cited, one in Alberta and the other in Nova Scotia, 2,900 miles apart. Both customers simultaneously experienced overheating of the bearings, and correspondence was futile for checking up all possible causes of overheating. Personal visits by the company's engineers being necessary to determine and remove the cause of trouble.

Owing to the size of the country sending engineers in this way to a particular site and generally servicing the equipment are very expensive items and the only satisfactory alternative is to have direct representation or competent engineering agents in the principal cities. Before leaving this phase of the subject, mention might be made of the preference in Canada for "Made-in-Canada" goods and the fact that all electrical equipment has to be approved by recognised authorities such as the Hydro-Electric Power Commission of Ontario or the Board of Electrical Examiners of Quebec. All this increases the difficulties experienced by British manufacturers.

Electrical Manufacturing

The electrical industry in Canada is well established and in 1936 employed 17,000 people. The productive capacity of the plants of the Canadian manufacturers is much overdeveloped for present market needs. The quality of the products is good and the design excellent, particularly in overhead line equipment, high-voltage transmission equipment and generating equipment such as large waterwheel generators, &c. The general industrial equipment workmanship is perhaps not to the same standard as that applying to United Kingdom equipment but satisfactorily meets the market requirements.

The importance of strictly adhering to promised delivery dates is often not understood by United Kingdom manufacturers. Transportation of heavy equipment to remote power sites and mining companies' premises is often only possible by sleigh over snow roads and frozen lakes. One week's delay in despatch from the works at the end of the winter may mean months of delay in getting it to the site.

Appliances in Ontario

THE matters considered during 1938 by the Merchandising Committee of the Association of Municipal Utilities, Ontario, included various phases of the electric-range, lighting and water-heater campaigns.

According to the report of the chairman (Mr. A. W. Bradt), published in the *Bulletin* of the Hydro-Electric Commission of Ontario, it was decided to continue the payment of the $3 advertising allowance to retailers for each new electric range sold and the policy of installing free three-wire services for purchasers of cookers was recommended.

A suggestion that hydro municipalities might finance electric ranges and other appliances through a finance corporation, organised by these municipalities was considered by the committee; it was decided, however, that such a plan would not be practical, and it was recommended that the present arrangement, whereby municipal hydro systems finance ranges and other appliances for their dealers and for their consumers, should be promoted.

The subject of low-priced electric ranges received considerable attention. It was agreed that there was a decided need for a lower priced range to satisfy the requirements of customers who were unable to pay for a more expensive article.

The question of adding a free 3-kW circulating type heater to the present "set-up" was considered by the committee. It was learned that in a great many instances a circulation type heater was more satisfactory for the small user than a flat-rate heater would be.

The matter of controlling water heaters and charging for water heater service, where control was exercised, was also considered by the committee. Several suggestions were made for the treatment of customers whose heaters were cut off during the peak periods. It was proposed that a discount be allowed, or that larger sized heaters than necessary with uncontrolled service be installed and that the rates for controlled heaters be adjusted to take care of the cut-off period.

THE GRID IN 1938

Central Board's Activities

IN its tenth annual report, published this week (Whitehead Morris, Ltd., 1s. net), the Central Electricity Board discusses developments in the grid system during 1938 when the total output of public supply stations was 24,376 million kWh, an increase of 1,474 million kWh over the previous year. At the end of the period the grid comprised 4,378 miles of transmission lines, including 2,994 miles at 132 kV, and 304 switching and transforming stations with an aggregate transformer capacity of 10,442,000 kVA.

Major additions to the system included 132-kV lines to Corby, Ebbw Vale and Scunthorpe, to enable the local authorities to provide or to increase supplies to the steel works of Stewarts & Lloyds, Richard Thomas & Co., and Appleby-Frodingham. For the same purpose a 66-kV line was run from the new Chester transforming station to Shotton to meet the requirements of John Summers & Co.'s ironworks *via* the North Wales Power Co. Other extensions involved the construction of 132-kV lines between Lydney and the Cardiff-Portishead link and between Brighton and Worthing, in addition to a number of 66- and 33-kV lines.

Work was begun on the transforming stations adjoining the new Littlebrook selected power station and their 132-kV connections to Northfleet and Hastings, on a 132-kV line from Stourport to Worcester and on stringing the second circuits on the existing 132-kV lines from Ironbridge station to Wolverhampton and Ocker Hill.

The number of selected stations remained at 137 with an installed capacity at the end of the year of 8,264,160 kW. In addition to these the Board controlled the operation of 35 non-selected stations. As an insurance against delays in construction, the Board arranged for 200,000 kW of generating plant to be installed in such stations as soon as possible in addition to the new plant already provided for in its programmes for 1939, 1940, 1941. Plant included in the 1938 programme with that due for commissioning but not completed in 1937 amounted to 884,500 kW of generators and 9,565,000 lb. per hr. of boiler capacity, of which 761,500 kW and 8,229,500 lb. were brought into service. A new 30,000-kW set was wrecked and two other new 30,000-kW and one new 50,000-kW sets suspected of the same weakness were withdrawn from service.

More important sets put into commission included a 60,000-kW turbo-alternator at Fulham, 50,000-kW sets at Dalmarnock, Clarence Dock, Kearsley, Barton, Hams Hall, Ironbridge and Portishead, a 37,500-kW unit at Southwick and 30,000-kW units at Portobello, Hartshead, Blackburn Meadows, Longford (two sets), Stourport (two sets) and Hackney.

Arrangements were made with undertakings to install 824,500 kW of generating plant and 11 million lb. per hr. of boilers. A list of this plant, estimated to cost £14.5 million, is given in an appendix. The construction of a station with an initial installation of two 30,000-kW turbo-alternators and three 300,000 lb. per hr. boilers, was started by the Beds, Cambs and Hunts E.P. Co. at Little Barford and arrangements were made with Ipswich Corporation to build a new station by the autumn of 1942.

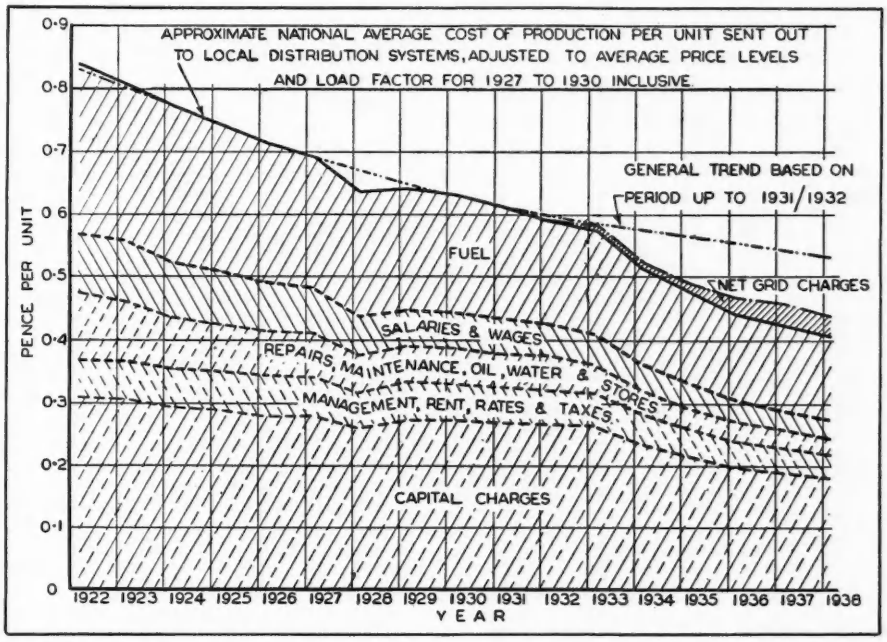
Specifications and Research

The Board issued specifications for switchgear, transformers and other equipment to form a pool of reserve apparatus as an air-raid precaution to be paid for partly by the Government and partly by a levy on supply undertakings as in the case of standardisation of frequency. In connection with research into surge phenomena measurements for determining the electrical characteristics of overhead lines with double earth wires at the terminations were carried out on the new 132-kV line between Leicester and Corby.

Investigations into the characteristics of natural lightning in Nigeria were also started. Three sets of "Thyrite" arrestors, the first of the type to be made in Great Britain, were ordered for the 132-kV lines at Barking which are particularly affected by lightning storms. Arc-suppression coils are being installed on the 33-kV lines emanating from Hartshead and Stockport. Expulsion tubes fitted to some 33-kV lines to reduce the probability of outages due to lightning have proved satisfactory and their use will probably be extended.

Arc-control devices and higher-speed mechanisms have been fitted to the original 132-kV circuit-breakers with a view to increasing their rupturing capacity and 132-kV breakers with low oil content have been installed at Lydney. Breakers on the lower-voltage grid are also being modernised.

Anti-dirt insulators for transformer, circuit-breaker and cable sealing ends were developed for use near power stations with cooling towers and where the atmosphere is polluted. Over-


APPROXIMATE NATIONAL AVERAGE COST OF PRODUCTION PER UNIT SENT OUT TO LOCAL DISTRIBUTION SYSTEMS, ADJUSTED TO AVERAGE PRICE LEVELS AND LOAD FACTOR FOR 1927 TO 1930 INCLUSIVE
GENERAL TREND BASED ON PERIOD UP TO 1931/1932
FUEL
NET GRID CHARGES
SALARIES & WAGES
REPAIRS, MAINTENANCE, OIL, WATER & STORES
MANAGEMENT, RENT, RATES & TAXES
CAPITAL CHARGES
PENCE PER UNIT
0·9
0·8
0·7
0·6
0·5
0·4
0·3
0·2
0·1
0
1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932 1933 1934 1935 1936 1937 1938
YEAR

This analysis of electricity production costs shows the speeding-up effect of grid operation upon the downward trend already in evidence before 1933

head-line and sub-station insulators and line points have been subjected to routine tests while in service. Aluminium line conductors have received petroleum-jelly coatings in corrosive atmospheres; normally no anti-corrosion measures beyond those originally adopted are required.

High-speed selective distance protection has continued to operate well. Field tests on the carrier-current system installed on the 132-kV Ribble-Southport line have resulted in a decision to adopt it for the 132-kV lines from Barking to Brimsdown and from Littlebrook to Hastings.

Supplies from the Grid

At the end of the year 217 of the 560 distributing undertakings in the areas in which the Board was trading received direct supplies from the grid and 300 more received indirect supplies through the systems of other undertakings. More than 97 per cent. of the electricity sold (excluding North Scotland) came from the grid. During the latter part of the year, the nine areas of the grid were operated as one interconnected system with control co-ordinated from a national control system at Bankside. A winter peak of 6,700,400 kW was met by 159 generating stations; in addition 71 independent stations supplemented their own production by supplies from the grid. Of the 171 generating stations, operated under the direction of the Board, only 30 ran for the full year and 14 supplied half of the total kWh generated for the Board.

The decline in the proportions of spare plant since the grid started is shown diagrammatically and the resulting capital

saving is assessed at £22 million, nearly three-quarters of the capital expenditure on the grid and its extensions to date. Other diagrams are included in support of the claim that in spite of the rising price of coal (*e.g.*, from 14s. 9d. per ton in 1935 to 20s. 3d. in 1938 on the average) the aggregate cost of generation was 24 per cent. below the 1932 level and, omitting coal, 37 per cent. below. The average fuel consumption per kWh was 20 per cent. less than under independent operation in 1932 (the Board began general trading in some areas on January 1st, 1933), making a saving, at the average fuel price in 1938, of £3,250,000.

A fourth diagram shows that, including losses in the grid, the adjusted average cost per kWh sent out to local distribution systems in 1937-38 was nearly 24 per cent. below the figure which would have been reached had the normal trend of improvement prior to 1933 been continued. Adding the net amount paid by the undertakings to the Board to meet the expenses of the grid, the net annual saving in 1937-38 is given at more than 17 per cent. equivalent on the national production of that year and the average price level for 1927-30 to £8,200,000.

While the total number of kWh required by undertakings from the grid was 4.7 per cent. below their estimates, the aggregate maximum demand was 2.2 per cent. more due to the cold weather in December. About 80 per cent. of this increase in demand was purchased by undertakings at the cost that would have been incurred under independent operation and the immediate increase in the Board's revenue was £75,000 —an upward departure from the normal trend no greater than the downward departure during the mild winters of 1934 and 1936.

Before the advent of the grid, it is reasoned, undertakings maintained spare plant for meeting abnormal demands and paid the charges on the plant in mild winters and their retail prices were necessarily fixed to cover such charges. Under the Board's tariff, however, they pay in each year only for the demand they make in that year and so make a relatively greater saving in mild winters with which to establish reserves to meet the extra cost in severe winters.

An outline of the trading conditions, the form of grid tariff and comparison of prices in different regional areas and population and electrical statistics for such areas are contained in appendices.

The amount which the Board is empowered to borrow remains at £60,000,000 and at the end of 1937 £52,500,000 had been raised. No further money was borrowed during 1938 and no stock was purchased for cancellation during the year.

Trading continued to progress satisfactorily and the balance of the account for 1938 was £2,754,368, representing an increase of £739,860.

Interest on all the stocks was charged to revenue to a large extent in advance of the obligation to do so. The total redemption fund contributions for 1938 amounted to £1,134,850. A balance amounting to £2,190,472 is carried forward to the next account.

ELECTRICITY SUPPLY STATISTICS

The Commissioners' Fifteenth Return

THE fifteenth annual Return of Engineering and Financial Statistics relating to authorised undertakings in Great Britain, which has been issued by the Electricity Commissioners during the past week (Stationery Office, 15s. net), covers the twelve months ended March 31st, 1938, for municipal undertakings (May 15th for Scotland) and December 31st, 1937 for company undertakings. Owing to a change in the year of account of joint electricity authorities, the figures for their undertakings concern the nine months ended December 31st, 1937.

The volume is divided into two main sections. Part I (engineering) gives for each undertaking particulars of the system and voltage, generating plant, m.d., kW connected, load factor, kWh generated or purchased in bulk, fuel consumption per kWh and kWh sold (subdivided into classes). Other figures give the number of consumers, population and kWh per head.

In Part II (financial) are included details for each undertaking of capital raised and expended under seven headings (*e.g.*, generation and distribution), revenue from different classes of supply and per kWh sold, working costs of generation, distribution, etc., and per kWh sold, and appropriation of surplus.

800,000 More Consumers

During 1937-38, the number of consumers increased by more than 800,000 (9.3 per cent.) bringing the total to 9,358,000, of whom upwards of 85 per cent. were domestic consumers, who took 894 million units more than in the previous year and took an average of 572 kWh each, as compared with the overall average of 2,058 kWh per consumer. Sales to consumers amounted to 19,263 million kWh representing 419 kWh per head of the 1937 population. Power took 54 per cent. and lighting, heating and cooking 38 per cent. of the kWh sold.

Inclusive of the Central Electricity Board there were 588 authorised undertakings supplying electricity. About 60 per cent. of the 23,012 million kWh generated was provided by public authorities, this proportion applying also to the aggregate capacity of generating plant installed (8,913,000 kW in 387 stations of all undertakings) and to sales of energy. Nearly 88 per cent. of the plant was contained in the 136 selected stations operating under the C.E.B.

Out of 1,944 boilers installed 465 had an evaporative capacity of between 50,000 and 100,000 lb. per hr., and 69 were for 200,000 lb. or more, while 736 had a working pressure of from 200 to 250 lb. per sq. in. and 78 of over 550 lb. Steam turbo-alternators formed 94.29 per cent. of the total generating plant installed. The 1,117 alternators included twenty-five of 50,000 kW and over, and forty-three of more than 30,000 kW but less than 50,000 kW. Transmission and distribution mains (including those of the C.E.B. but not services) had an aggregate mileage of 147,000, of which 103,000 are underground.

Supplies were given by 565 undertakings as AC to 8¼ million consumers; 267 also provided DC, while DC only was distributed by 29 others. The standard voltages, 230 and 400 V AC had been adopted by 417 undertakings, supplying 51 per cent. of the total number of consumers, but there were as many as 36 other declared voltages in use between 100 and 480.

Losses in transmission accounted for 11.3 per cent. of the gross public supply, and station auxiliaries for 5.58 per cent.

Based on kWh generated or purchased, the combined maximum load on undertakings was of the order of 8,230,000 kW and on generating stations 7,284,000 kW, giving a spare-plant margin of 22 per cent. The collective load factor was approximately 36 per cent. Over 30 million kW was connected to the mains. Some 13,992,000 tons of coal (including 2,293,000 tons pulverised) was burned at an average cost, including handling, of 18s. 6d. per ton, compared with 16s. 8d. in the previous year and amounting to 1.42 lb. per kWh generated.

Capital Expenditure

Capital expenditure of all authorised undertakings, including the C.E.B., amounted at the end of 1937-38 to £608,675,000 or £68 per kW of generating plant installed and an increase of £39 millions over the previous year. About 28 per cent. was allocated to generation, 10 per cent. to main transmission (including 6.3 per cent. for the grid), 48 per cent. to distribution and 7 per cent. to apparatus on consumers' premises. An increase of £7¼ million in the net revenue brought the latter up to £92,000,000, equivalent to 1.145d. per kWh sold and £15.1 per £100 of capital expenditure. Domestic consumers contributed £3.62 each or 1.52d. per kWh.

Working expenses at £49 million (an increase of £5.5 million) equalled £8.1 per £100 of capital expenditure and absorbed 53.6 per cent. of the revenue from working. Works costs of generation accounted for approximately 35 per cent., transmission and distribution for 19 per cent., management for 20 per cent. and rates for 14 per cent.

A gross surplus of nearly £46 million (7.5 per cent. of final capital expenditure) was appropriated in accordance with the following percentages:—For public authorities: 27.4 for interest, 51.5 for loan repayments, sinking fund, reserve and depreciation, 6.2 for income tax, 14 for special expenditure including capital outlay, and 2.5 (£585,000) in relief of rates; these appropriations decreased the balances on net revenue account by £389,000. For companies the appropriations were 54.5 per cent. for interest and dividends and 40.7 per cent. for depreciation and reserve; there was an increase of nearly £423,000 in the balances on net revenue account. Preference and ordinary dividends averaged 5.64 and 7.29 per cent.

Over 103,000 persons were employed in electricity supply and received in salaries and wages (chargeable to revenue) £15,686,000. Of these 18,000 were engaged on generation, 60,000 on distribution and 25,000 on administration, the total being equivalent to 12 persons per 1,000 kW of generating plant.

London's Supply

J.E.A. Report

WITHIN the area of 1,841 sq. miles covered by the twelfth annual "General Review of Statistics" (5s.) published by the London and Home Counties Joint Electricity Authority, there are 75 electricity undertakings, including the Authority itself. This compares with 81 in the previous return, the reduction being brought about by the amalgamation of the Central London companies, so that the number of company-owned undertakings decreased from 36 to 30, municipal undertakings remaining 44 in number.

In the 53 generating stations in the area there was an aggregate installed capacity of 2,610,000 kW, compared with 54 stations with 2,367,000 a year before. Most of the plant was concentrated in the 26 selected stations which had a total capacity of 2,425,000 kW, some two-thirds of which was installed in the 13 company stations.

The maximum load on the undertakings, including bulk supplies given, was 2,619,000 kW (2,372,000 kW in 1936-37), and on the generating stations alone 2,084,000 (1,855,000) kW. The figures for 1937-38 thus show an increase of 247,000 kW, or 10 per cent., in the case of undertakings, and 229,000 kW, or 12 per cent., for generating stations. Connected load totalled 8,412,000 (7,333,000) kW, an advance of 1,079,000 kW, or nearly 15 per cent.

Altogether 6,685 million kWh was generated, an increase of 733 million kWh, or just over 12 per cent.; 6,599 million kWh was generated under the direction of the C.E.B. On the basis of the 1931 census (9,089,000 population) this works out at 736 kWh per head of the population. In addition, transport authorities generated 1,095 (1,076) million kWh.

Particulars of Sales

Sales, excluding bulk supplies to authorised undertakings, rose by 517 million kWh, or 12 per cent., to 4,798 million kWh. Actually the increase was somewhat greater, as the figures for the J.E.A. are for nine months only, on account of a change in the financial year. Local authorities sold 1,945 million kWh and companies 2,762 million kWh, against 1,743 and 2,424 million kWh respectively in the previous year. Apportioned to different classes of consumers the percentage sales were: Lighting, heating and cooking, 51.6 (50.9); power, 35.3 (same); public lighting, 2.3 (same); and traction, 10.8 (11.5). Revenue per kWh from lighting, heating and cooking worked out at 1.63d. (1.73d.); power 0.79d. (0.80d.); public lighting, 0.92d. (0.97d.); traction, 0.49d. (0.47d.); and bulk, 0.50d. (0.49d.). The decrease in the average price for lighting, heating and cooking supplies, which totalled 2,474 million kWh against 2,179 million kWh in 1936-37, benefited consumers by approximately £1,097,500, and in power supplies (1,694 million kWh against 1,511 million kWh) by £65,300. The average price of separately metered lighting supplies fell from 3.06d. to 3.00d., of heating and cooking supplies from 0.87d. to 0.79d., and of lighting, heating and cooking supplies with combined metering from 1.28d. to 1.24d.

The total number of consumers in the area at the end of the period under review was 2,398,000 (public authorities 1,248,000; companies 1,150,000), an increase of 193,000.

Expenditure and Costs

Capital expenditure up to the end of 1937-38 amounted to £157,769,000 (£148,008,000 a year before), including £95,328,000 (£89,174,000) by companies, £57,052,000 (£53,798,000) by local authorities and £5,389,000 (£5,036,000) by the J.E.A. Of the total 30.5 (31.6) per cent. was for generation, 55.8 (55.2) per cent. for transmission and distribution and 13.7 (13.2) per cent. for apparatus on hire and miscellaneous items.

The total working costs amounted to £20,355,000 (£18,465,000), equal to 0.61d. (same) per kWh sold. Included in this was £15,884,000 (£14,397,000) generation costs and energy purchased, or 0.48d. (same) per kWh sold. Working costs of local authorities averaged 0.73d. (0.72d.) per kWh sold, of companies 0.57d. (same) and the J.E.A. 0.65d. (0.60d.).

On the year's working there was a gross surplus of £13,222,000 (£12,760,000). Of the £4,039,000 (£3,881,000) of municipalities £1,059,000 (£991,000) was appropriated for interest, £1,910,000 (£1,685,000) for sinking and repayment funds, £605,000 (£768,000) for capital outlay and special expenditure, £255,000 (£303,000) for income tax, £211,000 (£103,000) for depreciation and reserve and £152,000 (£155,000) for relief of rates.

Companies allocated £1,617,000 (£1,570,000) for interest and paid £646,000 (£636,000) to preference and £2,443,000 (£2,393,000) to ordinary shareholders, and transferred £3,888,000 (£3,554,000) to depreciation and reserve. Income tax amounted to £177,000 (£151,000).

Here and There

By "Nomad"

THERE is no doubt that electricity is popular on the farm when it can be obtained at an economical rate. Last week, with Mr. Moody and Mr. Rogers, of the County Company's Essex area, I visited Mr. French, whose farm is at Wash Row, Laindon. He was full of enthusiasm for his electric steriliser, which is an Aveling Barford model fed by an electrode boiler. He assured me that electric sterilising—using two gallons of water at 12 lb. pressure—is considerably cheaper to operate than the old method of a boiler which necessitated coal, paraffin to get the coal going quickly and a great deal of labour. His fifty cows, yielding 120 gallons of milk a day, are milked by an Alfa-Laval electric milker and, during the last eight years, he has never had a rejected sample—a pretty good record. His supply, in common with the rest of the County Company's area, is at ¾d. per kWh. Mrs. French is just as keen on her electric cooker.

* * *

It seems, from what I was told of the County Company's experiences, that in nine cases out of ten electricity is introduced to the farm for domestic purposes and afterwards extended to power. This condition applies more to the small

A 25-kVA pole transformer supplying a poultry farm of Sterling Poultry Products, Felsted [*Elec. Rev. photo.*

farm, particularly the small family farmer. In contrast, in some parts of the country there are dairy farmers using 15,000 kWh; Hallmark Hatcheries, a poultry farm which I visited later with Mr. Rogers and Mr. Moody, had used, so I was told, 33,000 kWh in three months.

* * *

Mr. Rogers (the Essex area Development Officer) told us that his practice was to obtain the rural load whatever the demand might be, although it often means a bad load factor. Mr. Bremner's 88-acre fruit farm which I visited afterwards, however, provides an almost ideal 24-hour load for six months of the year. He specialises in Cox's orange pippins and has storage accommodation for 160 tons of fruit. A number of J. & E. Hall 3-HP compressor units maintain the temperature of the heat-insulated rooms at about 40 deg. F., the supply being obtained from a 25-kW pole-mounted transformer off an 11,000-V line. The CO_2 content of the atmosphere is maintained at 5 per cent. by the use of electrical recording instruments mounted outside the rooms, and from the same panel defrosting is carried out twice a day. A caustic soda air scrubber is shortly to be fitted to reduce the oxygen content from 17 per cent. to 2½ per cent., which, Mr. Bremner assured me, will enable him to keep his Cox's in fine condition until April of the year following harvest. Electricity is also used for the apple grader.

* * *

I was surprised at the rapid development which has taken place in this essentially rural area of Essex. Great credit is due to Mr. Rogers, the Development Officer, in connecting up, from practically nothing ten years ago, over a hundred farms in an area of just over 700 sq. miles. Mr. Moody showed me a map of the area to give some idea of its sparsity of population. Yet there are, he assured me, 523 miles of medium-voltage and 367 miles of 11-kV lines, supplying between thirty and forty thousand consumers with a connected load of about 71,000 kW.

MEETINGS AND DISCUSSIONS

Views on Electricity Tariff Construction. Training Personnel in the Plastics Industry. Sources of Interference with Radio Reception in Aircraft

There was an interesting discussion on the I.E.E. paper on electricity tariffs in London last week, in the course of which the opinion was expressed that standardisation would be brought about in this country at once if someone told the industry to get on with the job. At a Wireless Section meeting this week a paper was presented dealing with radio in aircraft, in which sources of interference with reception were discussed and precautions against fire risk suggested.

Electricity Tariffs

THE paper describing recent German and French electricity tariff legislation (to which reference was made last week) was presented at the INSTITUTION OF ELECTRICAL ENGINEERS in London on March 30th.

Mr. R. Kauffmann's outline was followed by a short commentary by Mr. J. W. Beauchamp, who remarked that a quarter of the total present output of electricity was consumed for domestic purposes and represented one-third of the revenue. It would not be long before those proportions would be nearer 50 and 60 per cent. of the totals.

Mr. J. M. Kennedy opened the discussion by stating that the paper had brought the two-part tariff for domestic purposes definitely to the forefront, which was most important. Where there was the will to standardise, no financial or other reasons would be encountered against fixing the standing charge component in this country. If they could get away from the rateable value basis so much the better from the Commissioners' point of view. The running charge appeared to be rather higher in Germany than in this country, probably for reasons of expediency. The right of the consumer to choose at the end of the year whether he should be charged at the flat rate or on the two-part tariff was most important and frequently ignored in this country. That right ought to be brought home to supply authorities in this country for it was a matter of equity that the consumer should know that he could elect to be changed over from the flat rate to the two-part tariff.

The proposed form of tariff for farms would be very acceptable in this country, but the comparatively low fixed charge and the compulsory offer of an off-peak-load tariff must be considered in relation to the comparatively high running charge. The separate metering of cooking load was not favoured in this country. The majority of domestic consumers had incomes of about £250 a year and there was no margin for luxuries. Accordingly they must be offered terms which would compete with other means of heating and cooking.

Benefit of Simplicity

Mr. J. W. J. Townley thought that one great benefit of the Continental proposals would be uniformity of the structure of the tariff and not the actual price charged. Therefore one explanation would suffice for all consumers. In his own area he had a simple tariff which everyone could understand, *viz.*, 1d. per kWh, inclusive of the hire of the cooker. The result was 50,000 domestic consumers in a very poor area and a consumption of 625 kWh per year per consumer. Many undertakings provided every opportunity for their consumers to change over from the flat rate to the two-part tariff, but they must not be encouraged to change over too frequently, otherwise the costs would be increased. He would not like it to be felt that supply undertakings in this country deliberately failed to tell their consumers when they could change over to the two-part tariff. His undertaking removed 150 tons of money yearly from prepayment meters. With regard to the need for more statistics, he could say that steps had already been taken in that direction.

Mr. C. T. Melling remarked that the German tariff seemed to include part of the fixed charge in the running component and to do otherwise would be incorrect, since the tariffs were framed on what the traffic would bear rather than on what it cost to furnish the supply. The co-relation between the bases on which fixed charges were assessed was very poor in this country so that standardisation would result in many consumers receiving larger bills. It was not profitable to offer poor users too low a tariff. Rather should propaganda be used to make poor consumers into better ones. The first step towards any standardisation in this country would be prevention of any increase in the number of undertakings that could be set up so as not to add to the many tariffs already in use.

Mr. W. Fennell remarked that once again they had acted on the Continent while we in Britain merely talked. All they were waiting for in this country was for somebody to say "go," after which the supply authorities could refer all complaints of large bills to the Commissioners. In mid-Cheshire there were many houses with very large living rooms so that it would seem wise to place an upper limit as well as a lower one to the room area on which the fixed charge might be based; he preferred a low running component rather than a low fixed charge. With a hire-purchase scheme ten cookers might be connected per week whereas with a plain hire scheme at least 100 a week would be installed. As competition became more severe more cutting would be done in order to get what little business remained; at least, that was the usual characteristic of British methods. In his area 97 per cent. of consumers were on a two-part tariff. Some types of load did not need a tariff, but rather a bargain between those concerned.

Mr. D. J. Bolton contended that tariffs could not be standardised until the vocabulary had been standardised. Tariff nomenclature in this country was in a shocking state. The shape of the tariff was determined by the market and it had nothing whatever to do with costs. If a low kWh charge could be obtained universally then public opinion would hack away at those fixed charges which were too high and so cause them to be reduced.

Miss C. Haslett said that more work was needed to explain the tariffs now available, since there was much misunderstanding about the cost of running various appliances. For fifteen years she had been advocating a universal running charge of 0.5d. per kWh, plus a fixed charge, and now was the time to take definite action. It should not be beyond the wit and wisdom of the supply industry in this country to bring about standardisation, and she proposed the formation of a committee to clarify the vocabulary and standardise tariffs. The public really did look to the industry to clarify this matter, for it was most difficult for many people to find out what electricity was going to cost in various parts of the country. She concluded with a plea for a really serious attempt to solve the problem.

Chief Requirements

Mr. W. E. Burnand remarked that even the Germans with their flair for such things did not seem to have got very far with tariff standardisation or uniformity. Proposals to sell a shillingsworth of electricity would involve far more explanation than present tariffs. The requirements were for the lowest possible cost and the minimum of restriction on use. Years ago he had proposed a tariff consisting of a service charge with a low kWh charge and a discount, plus a high rate only when a maximum "safe" supply was exceeded.

Mr. J. I. Bernard considered the low standing charge on the Continent to be due to a timid approach because of the fear that too high a figure might be restrictive; also a large use of such small appliances as kettles and toasters was expected before a large demand arose for cookers. Cooking had become commonplace in this country whereas it was relatively new on the Continent, this country being far ahead of either Germany or France in so far as domestic supply was concerned. He agreed that nomenclature caused much confusion among consumers. He had been much impressed by the "Shufa" organisation in Berlin. It was the only one of its kind in the world, and had been built up by Mr. Kauffmann. It possessed the names and addresses of two million consumers and the credit standing of any one of them could be ascertained in a very few minutes.

Mr. W. J. Cooper was of the opinion that standardisation would be brought about in this country at once if someone told the industry to get on with the job. Now was the time for legislators to take action.

Mr. Kauffmann, in reply, explained that the burden of taxation in Germany compelled the fixed charge component to be low, while there was also a psychological limit so that the remainder had to be included in the kWh charge. Working class consumptions like those in this country were quite out of the question in Germany, from the point of view of price of energy alone, apart from any other charges. The rural tariff included power used by threshing machines and all similar devices, but not the cost of delivering the supply. It was also expected that many small poultry and vegetable farms would be assessed at the domestic rate rather

than the farmer's rate. Small consumers could change over from the flat rate to the two-part tariff as often as they liked. This would involve extra cost and it was one of the matters which he did not consider well thought out. Neither electricity nor gas heating was in itself sufficient and both were too expensive for the severer winter conditions in Germany and so central heating or the old-fashioned stove would continue to be used.

Mr. J. W. Beauchamp pointed out that Mr. Burnand's suggested method of charging would require a special meter, but he would not get it. Good as it was to gather in "off-peak-load" one must remember that if too much were obtained the peak itself would commence to wander throughout twenty-four hours.

Training Technical Personnel

A PROBLEM which is now receiving serious consideration by the leaders of the plastics industry is the provision of trained personnel to meet future requirements. Some of the steps which are now being taken were outlined by Mr. H. V. Potter, B.Sc., F.I.C., M.I.Chem.E., managing director of Bakelite, Ltd., in the course of a paper, "In the Trail of Plastics," given to the Society of Chemical Industry, Liverpool, on March 31st. Technical colleges and polytechnics, it was stated, already included plastics in their syllabus, grants for study were made and scholarships had been founded.

Mr. Potter discussed the effects which plastics had produced in other industries, the general conclusion to be drawn being that the growth of the plastics industry had been beneficial. Several instances could be cited in which plastics had opened up entirely new lines of development. As an example of this the lecturer mentioned that as an outcome of co-operation between Aero Research, Ltd., and his company a special material had been developed which had a wood facing and could be glued to other wood members. This material greatly increased the bearing strength of wood in which it was incorporated and was sufficiently important to justify its inclusion in every aeroplane in current production by the De Havilland Aircraft Co., Ltd.

Radio in Aviation

CONDITIONS peculiar to aircraft operation in radio-telegraphy and radio-telephony, with particular reference to the Royal Air Force, were surveyed in a paper by Mr. N. F. S. Hecht (Air Ministry) which was read before the Wireless Section of the INSTITUTION OF ELECTRICAL ENGINEERS in London on Wednesday.

The author referred to certain facts and requirements not previously mentioned in published documents. No attempt was made to describe the equipment itself, the paper being more concerned with fundamental principles, stressing aspects not usually met with in ordinary radio-communication, particularly sources of interference with reception and of danger to the aircraft and its occupants. For example, the author stated that, bonding to "earth" was necessary to prevent the occurrence of large potentials between parts and so reduce the fire risk arising from sparking. This condition arose in aircraft fitted with powerful transmitters operating on a wavelength of about 12 metres generated by a valve circuit taking 2 kW (anode) at 5,000 V.

Also, the introduction of high-gain superheterodyne receivers with an oscillating aerial circuit resulted in severe interference, some forms of which were avoided by the use of non-oscillating aerials. The most fruitful sources of such electrical noise were bad contacts between rubbing parts of the fuselage structure, cross-over points in straining wires, etc. Complete bonding had to be insisted upon, though it caused considerable trouble and expense during erection and in maintenance.

High-voltage windmill-driven generators for the transmitter were a constant source of trouble, causing preference for motor-generators or dynamotors driven directly from the central battery on the aircraft. This method offered advantages, but its disadvantages should not be lightly set aside. For low-voltage supplies there had been a pronounced tendency to discard accumulators and to substitute a low-voltage winding in the motor-generator; but this arrangement was not of universal application.

The provision of high voltage for the receiver and of grid bias, which must be perfectly smooth, had been more troublesome than any other section of power supply. There had been a determined effort to do away with dry batteries and obtain instead a separate output from the generator. The whole question of power supply could be considerably simplified by employing AC, if the weight of smoothing equipment could be kept within reasonable limits.

The effects of changes of temperature during flight on the performance of radio apparatus had become an acute problem. In half an hour there could be a temperature change from +20 deg. C. on the ground to −40 deg. C. at an altitude of 30,000 ft. The resultant effect on inductance coils and condensers was seriously to alter frequency (wavelength) and, moreover, accumulator performance deteriorated at lower temperatures. Also lowered atmospheric pressure had material effects by reducing insulation, due to corona losses, by lowering microphone efficiency and weakening the vocal output of the speaker.

The fire risk on aircraft was a constant cause of worry and the author described several peculiar forms of hazard. Precautions included special bonding for petrol pipes, while the presence of high voltages in close proximity to the operator made careful planning necessary in the design and lay-out of circuits to avoid the chance of electric shock.

It was a remarkable fact that the number of occasions on which lightning discharges had occurred on aircraft in flight was very small. Damage due to lightning was usually slight and fatal accidents or even serious injuries were practically unknown. Serious danger from this cause could be eliminated by taking quite simple precautions.

The paper ended with comments on peculiar features of direction-finding under aircraft conditions.

Battery Vehicles

AT the informal meeting of the INSTITUTION OF ELECTRICAL ENGINEERS in London on March 27th Mr. G. O. McLean opened a discussion on "Electric Battery Vehicles and their Future Possibilities." He said he felt very strongly that the electric vehicle had not received the recognition it deserved. His remarks stressed future possibilities, touching briefly on the history and progress that had been made. In the year 1918 "electrics" in Great Britain numbered 100 and by 1938 the total was 4,000, a definite advance though certainly not comparable with the growth in number of the petrol vehicles, but it must be remembered the petrol cars had only the horse to compete with.

The placing of a number of inefficient electric vehicles on the market in or about 1919 had caused a severe setback. In common with other vehicles the design had steadily improved, notably in the loading levels and in accessibility to the battery. These matters were fully described and illustrated by a number of slides.

Charging rates had improved somewhat and the batteries were now robust and entirely reliable. Mr. McLean gave figures to show convincingly that with vehicles fitted with batteries unaffected by a high charging rate and given adequate facilities for charging or battery changing, the electric vehicle was as reliable and even cheaper than the petrol vehicle There was no duty beyond its scope. It was suitable for taxi, delivery van, light truck or for the 10-ton "steam-roller."

He asked all electrical traders to adopt battery vehicles, and said it was unaccountable why they had not done so. Undoubtedly the supply industry as a whole was apathetic or unbelieving. When questioned upon the matter chief engineers had raised objections that had no foundation but ignorance and indifference.

FORTHCOMING EVENTS

Institution of Electrical Engineers.—Thursday, April 13th. Institution, London, W.C.2. 6 p.m. "The St. Bartholomew's Hospital X-ray Tube for One Million Volts," by Messrs. T. E. Allibone, F. E. Bancroft, and G. S. Innes.

Transmission Section.—Wednesday, April 12th. Institution, London, W.C.2. 6 p.m. "Vibration of Overhead Line Conductors," by Messrs. E. W. W. Double and W. D. Tuck.

Meter and Instrument Section.—Friday, April 14th. Institution, London, W.C.2. 7 p.m. "A Critical Survey of American Metering Practice," by Mr. G. F. Shotter.

Scottish Centre.—Tuesday, April 11th. 39, Elmbank Crescent, Glasgow, C.2. 7.30 p.m. Annual general meeting. Informal discussion on "Engineering Education," with special reference to Electrical Engineering," to be opened by Prof. S. Parker Smith.

North-Eastern Centre.—Friday, April 14th. The Newe House, Pilgrim Street, Newcastle-on-Tyne. 6.15 p.m. Annual general meeting. "An Electrostatic Analyser for Complex Waves of Small Amplitude," by Prof. J. C. Prescott.

Institution of Engineers-in-Charge.—Wednesday, April 12th. St. Bride Institute, Bride Lane, E.C.4. 7.30 p.m. "Internal Telephone Systems," by Mr. F. J. Keene.

Diesel Engine Users' Association.—Wednesday, April 12th. Caxton Hall, Westminster, S.W.1. 4.45 for 5 p.m. Discussion on a "Bulletin on the Development of the Diesel Engine in all its Aspects during 1938."

Association of Mining Electrical Engineers (*South Wales Branch*).—Saturday, April 15th. Lecture on "Electric Shock and Resuscitation," by Dr. S. W. Fisher and Mr. G. M. Harvey.

CORRESPONDENCE

Every letter must be accompanied by the writer's name and address preferably, but not necessarily, for publication. The Editors cannot accept responsibility for correspondents' opinions

The Status of Meter Testers

IN the ELECTRICAL REVIEW of March 17th an advertiser invited applications for the position of meter repairer and tester, the remuneration being based upon the D.J.I.C. scale (18.6d. per hour for a 47-hr. week).

The advertiser required that applicants should be capable of using standardising instruments, including the potentiometer and its subsidiary equipment. For the intelligent handling of such apparatus a certain degree of technical knowledge is necessary, and is such as to raise the status of the applicant to a class differing from that of mechanician.

A position such as this should carry a remuneration based not upon the D.J.I.C. scale which caters for meter repairers (mechanicians) but upon the N.J.B. Schedule which alone suitably provides for such qualifications. By offering the D.J.I.C. scale the advertiser is lowering the status of the applicant to that of a mechanician.

In my opinion it is in the would-be applicant's interest to be alive to the circumstances, and either ban the position or demand a revision of remuneration based upon the lines suggested. F. GRIFFITHS.

Oldham, *March 27th.*

Rules and Registration

I am very glad to note the attention given to compulsory registration in your leading article of March 17th. This is a question which is worthy of the most earnest consideration by everybody connected with the electrical industry.

The final success or failure of all efforts to gain rapid electrical development must be vitally affected by the convenience and efficiency of the electrical installation. Electrical apparatus of all sorts obtains its supply through electric wiring, and if this is dangerously installed or inefficiently laid out the results cannot be as satisfactory as they should be. The quickest way to increase sales is by personal recommendation.

At the present time anybody who can afford a few tools can call himself an electrical contractor and do untold harm to the industry by causing fires, fatalities and failures which can so easily be avoided if the work is carried out by properly trained engineers and wiremen.

The voluntary system of registration has done much to improve matters, but experience in other countries where compulsory registration has been introduced should surely encourage the electrical industry to back by all means in its power any legislation introduced to make it illegal for unqualified people to hoodwink the public by offering ludicrous prices for inefficient and dangerous work.

It is a matter of vital importance to the whole industry and is worthy of unqualified support from all sections, not only from considerations of service to the public, but also to the rapid development of electrical services. HAMLYN DRAKE.

London, S.W.1, *March 27th.*

As a non-registered contractor I have read your leading article of March 17th with interest. The problem is not an easy one, but I consider it could be solved. Why not ask the eight thousand unregistered what they think about it—they are the interested party?

I notice that you state in your article that certain registered contractors are incompetent, ignorant and responsible for slipshod work. Registration means both the contractor and employee, but a client requires a conscientious contractor employing intelligent workmen, who have a full knowledge of building construction from the laying out of drains and ducts to the satisfying of a lady's colour scheme. Registration means nothing to him.

We keep two engineers constantly watching our work as it progresses, and also an inspector for our jobbing work. Even the best of charge hands sometimes requires advice from the right man—not necessarily an inspector. Our work is as good as most. We can guarantee it for a number of years, if necessary, but inspection is a big job in these days of many details.

The effect of rules is often that the contractor desires to find the cheapest way out while keeping within the rules, and clients suffer accordingly. To be satisfactory, however, they would have to be very stringent, and materials would have to pass a proving house. An inspector with the power of the law behind him and the many divergent opinions of the present day of the ways and means of carrying out electrical work would not make the position an easy one. Rules and regulations check developments and improvements, which the application of electricity is always calling for.

Inspection should be made periodically after the installation is completed to ensure first-class maintenance, as is at present carried out by the Home Office factory officials. This involves the right of access to private premises and I should not want an inspector coming in at any time to pull up my carpets or floorboards looking for trouble. This work would keep a few inspectors busy in many towns.

We find that staff engineers are responsible for many slipshod jobs on existing installations. Scamped work in private houses can generally be found in the roof, behind skirtings, under floors, &c., but if scamped work is found, does it mean that the whole of the work is condemned together with all similar work carried out by the firm? As it is of little use altering bad work, the query arises as to who is to pay for its removal, replacement, decorations, &c.

HIGGINS & CATTLE, LTD.
P. S. CATTLE, *Director.*

London, W.1, *March 29th.*

Artificial Lighting

Mr. H. A. Tinson's letter in your current issue hardly calls for any reply, as it appears to be strangely confused and surprisingly ill-natured. I do feel, however, that this type of correspondence is to be deprecated.

Mr. Tinson's second sentence is as discourteous to you as to me, in implying that you ought not to publish an article unless you agree with it. One presumes that you publish articles for the interest of the views or information furnished by the authors and not because you necessarily agree with them.

Mr. Tinson provides neither facts nor arguments in refutation of anything in my article. The latter did not consist so much of opinions or "ideas," whether "extraordinary" or otherwise, as of simple facts which can be confirmed by anyone, including Mr. Tinson himself, if he possesses normal sight and a photometer which is reasonably accurate.

It would be kinder not to dissect the letter in detail and I will therefore refrain from doing so.

London, W.C.2, *March 31st.* G. V. DOWNER.

Interference-free Appliances

New Mark Registered

IN 1937 a British Standard Specification for the limits of the magnitude, duration and frequency of occurrence of the electrical interference caused by electrical apparatus was published. The Specification indicated that a special mark was being registered the use of which would be permitted to manufacturers to denote that the apparatus bearing it was radio-interference-free within the specified limits.

This "Radio-Interference-Free Mark" has now been registered, and a reproduction is given in a new edition of British Standard Specification No. 800. It may therefore be expected that in due course electrical apparatus bearing the mark will become available to the public, but some time must necessarily elapse to enable manufacturers to re-design their equipment and to dispose of existing stocks of uncorrected apparatus. The mark may only be used by manufacturers who have obtained the necessary licence from the British Standards Institution.

Another important feature is the description of the schemes of sampling and the respective tolerances permitted for compliance with the Specification. The original edition merely laid down the limiting figure for the magnitude of the interference. Now a detailed scheme for the selection of samples for test purposes has been drawn up, and provision is made for articles which are made on a mass production basis as well as for articles of which only a small number of a given type are produced. By following the instructions given it is now possible to carry out tests to ascertain whether or not the Specification is being complied with.

Copies of the Specification may be obtained from the British Standards Institution, 28, Victoria Street, S.W.1, price 2s. 2d. post free.

Organisations of the Industry—X

RADIO MANUFACTURERS' ASSOCIATION

By R. P. Browne, B.Sc., Secretary

THE arts of radio broadcasting and reception are of the most recent developments in the onward march of electrical progress. The Radio Manufacturers' Association can lay no claim, therefore, to great antiquity. But the Association and the predecessors from which it has evolved into its present form have been in existence ever since the inception of the broadcasting service in this country, and have played no small part in the development of that system of communication the influence of which is world-wide in its application, and immeasurable in its effect.

[*Elliott & Fry.*
Lord Hirst of Witton, President of the R.M.A.

The first organisation was formed in 1922 under the title of The National Association of Radio Manufacturers. In 1924 the scope of the Association was enlarged to include wholesalers' and retailers' sections and the title altered by the addition of the words "and Traders." The three sections of the Association were bound by a common British policy, and an agreed system of trade terms.

In the season 1925-26, trading difficulties occurred which resulted in the reversion of the Association to its original form of a manufacturers' organisation and the Radio Manufacturers' Association, as it exists to-day, was formally constituted at the end of September, 1926.

Objects

The objects of the Association as stated in its "Constitution, Regulations and Bye-Laws" cover a wide field. Space will not permit a detailed description in this article. They may, however, be summarised in the following:

> "To promote, encourage, foster, develop and protect the radio industry and trade and ancillary and allied industries in the United Kingdom, and to apply such conditions to the conduct of the trade or business as in the opinion of the Association may be conducive to that object."

The Association, as such, does not attempt to interfere with the trading policy of its members. In that matter they are free to follow whatever course they may desire, individually, or in collaboration with their fellows. But, apart from this, the Association has been active in all other spheres which affect the development of the industry. Its work covers the political, technical and educational aspects, the development of export trade and restriction of imports, and the promotion of exhibitions and radio publicity in all forms.

Political Work

In the political sphere, the Association has, throughout, worked in the closest possible collaboration with the British Broadcasting Corporation to secure the ordered development of broadcasting both for the home and empire services. In the early days contact was maintained through the medium of the Radio Trade Committee on Broadcasting, on which the R.M.A. and the British Radio Valve Manufacturers' Association were represented. Later, as the R.M.A. became recognised as fully representative of British radio manufacturers, direct liaison between the Association and the B.B.C. was established, and has functioned more and more smoothly and satisfactorily with every passing year.

The Corporation and the Association realise that they are both engaged in the provision of a great public service. Whilst their points of view must necessarily be different, they have a common object; and, together, they have succeeded in building up in this country a broadcasting service which is second to none, and a television service which is two years in advance of that of any other country in the world.

It is not possible here to describe in detail all the activities of the Association in the political field. The work of Parliament impinges on the radio sphere sometimes in most unexpected places. For instance, in a Bill proposed by a local council for the extension of its boundaries, a clause may be included seeking powers to restrict the use of loud speakers. Or a water company may include in an apparently innocuous Bill a clause to prevent the connection of earth wires to the water mains. Matters such as these are constantly watched by the Association, through Parliamentary agents, and suitable action taken to safeguard the interests of the industry in cases where those interests are threatened.

On a much larger scale was the recent Hire-Purchase Bill. Here was a matter of very direct concern to the radio industry, in common with many others. Throughout the various stages of this Bill the R.M.A. held steadfastly to the view that reasonable modification and clarification of hire-purchase law was desirable and would serve beneficially the interests of public and trade alike. The Association felt, equally strongly, that it was essential for an equitable balance to be preserved between hirer and owner in any legislation, if an acceptable and workable measure were to be secured.

In this matter the Association co-operated with other interested bodies on a special committee set up by the Hire-Purchase Trade Association, and also took steps to organise the whole of the radio trade to secure a series of amendments. These efforts were crowned with success, and the new Act included the amendments for which the Association had pressed.

Technical Activities

The Association has a Technical Advisory Committee, with many sub-committees dealing with particular aspects. Close contact is maintained with the Institution of Electrical Engineers and with the British Standards Institution, and the Association has also co-operated with the British Electrical and Allied Industries Research Association in research work on the problem of electrical interference with broadcast reception.

[*R. Haines*
Mr. J. H. Thomas, Chairman

This is a matter of great concern to all interested in radio broadcast reception: broadcaster, manufacturer, and listener or viewer, alike. Many committees have been set up by the British Standards Institution to prepare specifications dealing with tolerable limits of interference, methods of measuring interference and means of suppressing it both at the source and at the receiving end. In all these matters the R.M.A. has played its part, and the Research Association has carried out such researches as have been required to permit the Standardisation Committees to complete their task. The stage has now been reached when the required degree of suppression and the means of obtaining it are known. It remains to secure the adoption of those means of suppression in practice, either voluntarily or by legislation.

Many other important technical problems have been dealt with, including safety regulations for mains-operated radio equipment; methods of testing and expressing overall performance of radio receivers; preparation of a performance specification for school receivers; and standardisation of batteries, condensers, fuses and other components used in the manufacture of radio receiving sets.

This work has involved active co-operation with other organisations in the electrical industry, including some from overseas through the medium of the International Electrotechnical Commission.

Mr. R. P. Browne, the author of this article

D

The problem of training radio engineers is one which affects everyone engaged in the radio industry. It is a problem which, some four years or so ago, began to assume serious proportions for there was a shortage of men of a suitable type to qualify for posts of responsibility in manufacturers' works or to service successfully modern broadcast receiving sets

The problem was a three-fold one :—(*a*) To recruit the technical staff of manufacturers; (*b*) to provide full technical training for service engineers; and (*c*) to improve the knowledge and efficiency of men already engaged in radio service work who had not been able to secure a proper technical training.

To meet these needs the Association—with the co-operation of the Board of Education, has done three things :—(*a*) It has arranged for the introduction in technical institutes throughout the country of a National Certificate course in radio engineering, successful students being admitted for a period of works training in a manufacturer's factory; (*b*) In co-operation with the City & Guilds of London Institute it has initiated a radio service course, in connection with which the first examinations were held last June with very encouraging results; and (*c*) It has prepared and published a Radio Service Manual which deals in simple fashion with the everyday problems of radio service.

Attention has also been given to the need for training teachers, and a radio vacation course for teachers was organised very successfully in 1937. It may be repeated.

Overseas Trade

The development of British radio trade in markets overseas has been the charge of the Association's Export Committee. In this matter the close co-operation of the Department of Overseas Trade has been secured. Much valuable work is done in the collection of information concerning conditions in the various markets, and particular requirements to be met. Negotiations for tariff revision and the modification of conditions which hinder the sale of British radio overseas are initiated and carried on through the medium of the Export Committee.

The protection of the home market from import competition is another matter to which the Association gives its constant attention. Among many steps taken to assist in this was the successful application for an Order which provides that radio apparatus offered for sale in this country must be marked with the country of its origin.

Exhibitions

Publicity work in its many forms has not been overlooked by the Association. Important in this connection is the Association's exhibition policy. Radio exhibitions in London and important provincial centres have been organised by the R.M.A. from time to time, and since 1926 the National Radio Exhibition at Olympia—popularly known as "Radiolympia"—has been promoted annually. This show has now come to be recognised as one of the "events" in the exhibition world.

In a short article such as this it is possible only to sketch in barest outline a mere suggestion of the Association's work. But sufficient has been said to indicate that in a comparatively short space of time much has been done to help the radio industry in its growth from very small beginnings to its present position as one of the firmly established industries of the country.

Radio manufacturers now stand at the threshold of a further advance. For the technique of television has been established. A great new industry has been born, in the development of which the R.M.A. is already playing its part.

Unidirectional Road Lighting

An Effective New System

On Wednesday last week a party of borough electrical engineers, public lighting engineers and others, inspected an installation of a new system of lighting installed on the Great Chertsey Road, Twickenham, by the General Electric Co., Ltd.

The road has a dual carriageway with a central grass division and the effect of the new arrangement is to give adequate lighting for the motorist on his track while the other track is apparently in darkness.

This effect is accomplished by using a specially designed lantern (the "Uniway") designed to take an 80-W or 125-W "Osira" mercury vapour lamp. It has a "peak" which directs the upper rays downward and a special diffusing front glass with a greater emitting area than usual, giving a lower surface brightness per sq. in.

It is in two parts—a detachable top into which the bracket arm slides horizontally, giving side entry mounting, and the main lantern body. They are of light-alloy construction and together weigh only 15 lb. The lantern is totally enclosed and weatherproof.

Adjustment is made by rotating the lantern on its bracket arm until it is accurately directed on to the roadway—a special sighting device being supplied to enable accurate alignment to be secured. The lamp is automatically centred and is firmly held in the correct focal position. Erection and wiring are easily accomplished.

A mounting height of 25 ft. is recommended for the lantern with a normal staggered spacing of about 50 yd. on each carriageway. The angle of the main beam is set at 80 deg. from the vertical and 5 to 10 deg. non-axial.

The principal idea behind this system is the accentuation of objects upon the road. The light is wholly at the rear of these so that they are sharply silhouetted to the motorist's view. The absence of light on the other half of the road gets rid of an undesirable distraction.

It is claimed for the new system that it reduces running costs by more than 60 per cent. without loss of efficiency. This is effected by the use of 125-W lamps where 400-W lamps would ordinarily have to be used, or 80-W lamps instead of 250 W.

Left: Great Chertsey Road installation (note blackness of right-hand carriageway). Centre: Method of mounting lanterns. Right: The "Uniway" lantern

INDUSTRIAL RESEARCH

The Work of the N.P.L.

THE assistance to industry which the National Physical Laboratory (director: Dr. C. G. Darwin) is in a position to render is, perhaps, not so fully appreciated as it might be.

The annual report of the Executive Committee (H.M. Stationery Office, 2s. 6d. net) for 1938 contains many examples of research which is specifically industrial beside much information about broader investigations of general interest.

For instance, in the Physics Department the Heat Division completed the development of a practical method of measuring the temperature of liquid steel under works conditions, jointly for the Iron & Steel Institute and the British Iron and Steel Federation.

A platinum thermo-couple and "quick immersion" technique are employed to withstand for 20 seconds temperatures up to a maximum of 1,690 deg. C. (the highest reached by liquid steel in an open-hearth furnace is 1,650 deg. C.) without depreciation of the couple or fracture of its sheath, which can be quickly replaced at small cost.

As many as twenty successive immersions are possible with a single sheath, and the time of immersion can be reduced to 4 seconds. Thermocouple equilibrium is reached in from 10 to 15 seconds and gives satisfactory agreement with an optical pyrometer working under black-body conditions.

Apparatus designed on the lines described in the N.P.L. report is in regular use at Sheffield and on trial at several other steel works.

X-ray Investigations

In the Radiology Division the X-ray crystal diffraction method has been of value in the investigation of the structural changes associated with the fatigue failure of metals. Other successful applications include the study of the recovery of lead after cold-work treatment, and the interpretation of variations in the structure of certain specimens of mica.

Progress has been made by the Engineering Department with the fundamental investigation of the deformation and fracture of metals, using X-ray diffraction methods to follow the internal changes of structure of the specimen under test.

In the Electricity Department improvements have been made in the methods and equipment used in measurements of the capacitance and power-factor of dielectrics, to secure adequate accuracy at high frequencies. The study of the fundamental dielectric properties of insulating materials has been continued, and attempts have been made to connect these properties with the structure of the material by working with pure materials of known chemical composition. Much of the time of the staff of the Electrotechnics Division was occupied by the extensive routine verification of the equipment used at the testing stations throughout the country for the checking of meters in accordance with the requirements of the Electricity Supply (Meters) Act, 1936. In addition to this work opportunity has been found for the theoretical and experimental determination of the AC resistance of multi-conductor cables, and for an investigation of the thermal time constant of a loaded six-way cable duct system.

Illumination Studies

In the Photometry Division investigations for the Illumination Research Committee included a study of the relative merits of light of different colours for various kinds of work and determinations of the value of illumination at which workers find it necessary to supplement daylight by artificial light. Work for the Ministry of Transport included a series of experiments to determine the contrast between objects and the background necessary for safe driving at a speed of 30 MPH. The maintenance of photometric standards involved the preparation of new sub-standards in anticipation of the adoption in 1940 of the new unit of luminous intensity.

The Radio Department has developed a constant frequency oscillator not needing outside control by mechanical or other means. This has been achieved by the design of inductances and condensers free from temperature change. The study of the source and characteristics of atmospherics is completed.

The Metrology Department, for the Australian Survey Corps, explored the possibility of ascertaining the average temperature of steel tapes in the field by observations of their electrical resistance. Another problem which presented interesting features was the measurement of the thickness of extremely thin flakes of mica.

A previous investigation carried out at the Laboratory showed that the risks of fire and explosion due to the generation of static electricity in dry-cleaning processes are considerably reduced by the use of special soaps, which, when dissolved in cleaning solvents, increase their electrical conductivity and so prevent accumulations of electrical charges. A portable instrument capable of showing whether the conductivity of a cleaning solvent is adequate has now been devised in the Electricity Department, and working drawings have been made and supplied to British instrument makers who are interested in the problem.

For the Extra-High-Voltage Laboratory twelve new condensers, each of capacitance 0.2 μF, and a working voltage of 100 kV, have been acquired. Each has ten times the energy storage capacity of the condensers incorporated in the original impulse generator. They have been successfully used connected in parallel in a high-current generator, and in series in a high-voltage, high-capacitance generator.

The earth impedance of a tower at high frequencies has been determined by measuring the voltage to earth from a point on the tower and the current flowing through the tower. The tentative conclusion so far reached is that the earth impedance of a tower is made up of a resistance component located in the earth and an inductive component dependent on the dimensions of the tower. Typical values for these components have been determined.

The volume of work carried out on a repayment basis for industry and private individuals continues to increase, and large numbers of tests required the setting up of special apparatus. The N.P.L. is frequently called on to carry out tests to determine the cause of failure of machine parts, while many requests are made for scientific information.

The Laboratory is always willing to answer inquiries which fall within the scope of its activities, and no charge is made for this service when experimental investigation is not needed.

Electricity Tariffs

A FRENCH version of the latest (third) edition of the German standard work on electricity tariffs by the late Dr. G. Siegel and Dr. H. Nissel, entitled "Die Elektrizitätstarife," has been made by Dr. A. Alexander-Katz. It is published by Electrodiffusion, Zurich, and contains 350 pages, 54 figures, and 139 sample tariffs, and is obtainable at 15s. from Electrical Service, 32-36, Fleet Lane, E.C.4.

The first part of "La Tarification de l'Energie Electrique," treats of the fundamentals of prices, demand and supply, with particular application to the sale of electrical energy. Demand for electrical energy is defined as the appreciation of its value by the consumer, and this varies with the various possible uses of electricity and the importance of the requirements it satisfies, and with the existence of competing methods.

A thorough analysis is made of all factors in the cost of producing electricity, and this leads to the basic problem of how to distribute such cost among the various classes of consumers. A complete synopsis of the solutions of this problem is given and the single solutions are submitted to criticism.

The second and longer part of the book deals with the shaping of electricity tariffs. The authors start with expounding the three fundamental types of tariffs: lump-sum, flat-rate and two-part, the mathematical foundations of which form the essential elements of cost prices. After comparing the merits and demerits of the three types the authors decide in favour of the two-part tariff from the angle of the supplier and also of the consumer. It is then demonstrated that each one of the three types makes necessary a great number of variations and implementations for definite supply undertakings and definite classes of consumers. This leads to an extended study of a great number of tariffs as used all over the world, and a survey of tendencies in twenty-four countries, with reflections on progress in tariff matters.

A final chapter is devoted to tariff unification. The disadvantages of the immense variety of tariffs are stressed and it is pointed out that notwithstanding the great divergencies of conditions a greater degree of simplification should be possible. Reference is made to the report of the British Committee of 1930 and similar work in other countries, *e.g.*, Germany and Switzerland. The authors conclude that the time has come in all countries for very considerable simplification and unification on the fundamental basis of two-part tariffs.

Finally, the author suggests that with maximum increase of distribution and utilisation of electricity, the question of the form of tariffs will recede into the background.

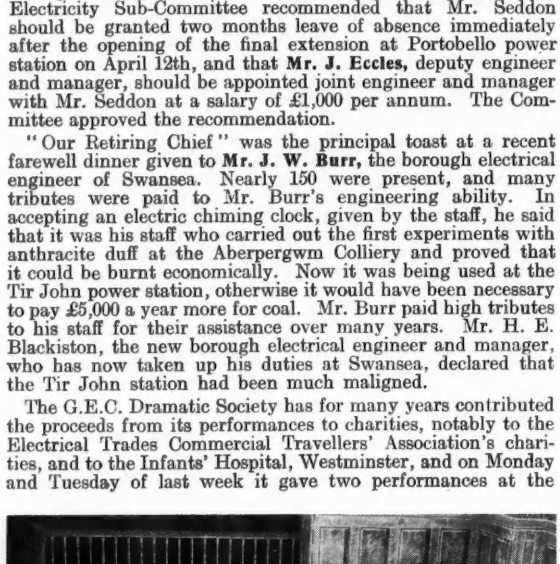
PERSONAL AND SOCIAL

Information regarding new appointments and other matters of interest for this page are welcomed

AT a meeting of Edinburgh Corporation Public Utilities Committee on March 31st, a letter was considered from **Mr. E. Seddon,** engineer and manager of the Electricity Department, intimating that he intends to retire under the superannuation scheme in July next year. Mr. Seddon, who will then attain the age of sixty, has not been in good health recently. The Electricity Sub-Committee recommended that Mr. Seddon should be granted two months leave of absence immediately after the opening of the final extension at Portobello power station on April 12th, and that **Mr. J. Eccles,** deputy engineer and manager, should be appointed joint engineer and manager with Mr. Seddon at a salary of £1,000 per annum. The Committee approved the recommendation.

"Our Retiring Chief" was the principal toast at a recent farewell dinner given to **Mr. J. W. Burr,** the borough electrical engineer of Swansea. Nearly 150 were present, and many tributes were paid to Mr. Burr's engineering ability. In accepting an electric chiming clock, given by the staff, he said that it was his staff who carried out the first experiments with anthracite duff at the Aberpergwm Colliery and proved that it could be burnt economically. Now it was being used at the Tir John power station, otherwise it would have been necessary to pay £5,000 a year more for coal. Mr. Burr paid high tributes to his staff for their assistance over many years. Mr. H. E. Blackiston, the new borough electrical engineer and manager, who has now taken up his duties at Swansea, declared that the Tir John station had been much maligned.

The G.E.C. Dramatic Society has for many years contributed the proceeds from its performances to charities, notably to the Electrical Trades Commercial Travellers' Association's charities, and to the Infants' Hospital, Westminster, and on Monday and Tuesday of last week it gave two performances at the



G.E.C. players in a scene from "A Spot of Bother"

Fortune Theatre, Drury Lane, of "A Spot of Bother," by Vernon Sylvaine, the proceeds of which will be given to the Electrical Industries Benevolent Association. This amusing play adds one more to the long list of successful productions by the Society, and it also gave it the opportunity of introducing a number of newcomers who acquitted themselves with distinction. The funmakers-in-chief were Frank Lewis as William Binkie Rudd, and William Leacock, as Christopher Watney, and both took full advantage of the many hilarious situations offered. Among the ladies, such tried artists as Lilian Ellison (Mrs. Watney), Joan Coltham (Margaret), Norah Symonds (Mrs. Cake), and Cecilia Ridler (Lottie) all combined to give the performances the finish which has given the Society a high place in amateur dramatics. Celia Moore, Frank Collyer, Clement Harrison, Graham Johns, Colin Cheyne, Stanley Wells and John Hurst in the other supporting parts, gave convincing performances.

Mr. D. B. McGrigor, O.B.E., M.B., Ch.B., D.M.R.E., has been nominated for the presidency of the British Institute of Radiology, incorporated with the Röntgen Society, for the session 1939-40.

Mr. C. O. Horn, B.Sc., A.M.I.E.E., telephone manager of the Leeds area, has been appointed Controller of Telecommunications in the G.P.O. Scottish Region, and has taken up duty in Edinburgh. In his new sphere Mr. Horn will have control of the telegraph and telephone system in Scotland under the direction of the Regional Director. He succeeds **Mr. B. L. Barnett,** who was recently promoted to London. Mr. Horn, a native of Portsmouth, entered the service of the P.O. in 1922. He was assistant engineer in charge of Rugby radio station from 1927 to 1930 and sectional engineer, Coventry, before appointment as telephone manager, Leeds, in 1936.

Mr. J. H. Laurence, manager of Henley's (South Africa) Telegraph Works Co., Ltd., who retired on March 30th, entered the service of W. T. Henley's Telegraph Works Co., Ltd., in February, 1899, as a general clerk in the stock room at the age of eighteen, and was appointed assistant to the late Mr. Odgers, manager of Henley's (South Africa) Telegraph Works Co., Ltd., in April, 1903. In January, 1921, on the retirement of Mr. Odgers, he was appointed manager of the South Africa Co. Mr. Laurence's successor will be **Mr. F. J. Head,** whose service with the company commenced in South Africa in April, 1905, and who was appointed chief assistant to Mr. Laurence in January, 1921. **Mr. R. W. Lord,** who has sailed for South Africa on his appointment as assistant to Mr. Head, began his career with Henley's as a junior in the Electrical Department at Woolwich Works in December, 1920. From the Estimating Department there he was transferred to the Contract Department indoor technical staff in November, 1923, and prior to his South African appointment was a technical assistant in the Contract Department.

Mr. J. H. Laurence

Mr. G. H. Dale, deputy borough electrical engineer, at South Shields, has been appointed borough electrical engineer in succession to Mr. N. T. Smith, who has secured a post with Warrington Corporation.

Mr. J. H. Gibson, B.Sc., has been appointed technical representative of "Thermovent" heating in N.E. England. He was formerly with Unity Heating, Ltd., and was recently associated with the Wardle Engineering Co., in the same area.

Mr. N. R. Elliott, deputy borough electrical engineer of Ilford, has been appointed borough electrical engineer of Gravesend, in succession to **Mr. C. F. McInnes,** who is shortly retiring.

In our last issue we referred to the second annual electrical carnival ball held in the Coronation Suite, Belle Vue, Manchester. Mr. Robertson Hare and Mr. Alfred Drayton, the well-known actors, attended during the evening and drew for the three principal prizes.

At the annual electrical carnival ball, Manchester. Left to right: Mr. Alfred Drayton, Mr. Robertson Hare, Mrs. Bert Wilson, Mr. R. C. Hawkins and Mr. H. H. Webster

OBITUARY

Mr. A. V. Clarke.—The death is announced of Mr. Ashford Vincent Clarke, J.P., A.M.I.C.E., M.I.M.E., A.M.I.E.E., which occurred on April 1st in his fifty-fifth year.

Mr. G. J. Andrews.—The death is reported of Mr. G. J. Andrews, a director of Enfield Rolling Mills, Ltd.

COMMERCIAL AND INDUSTRIAL NEWS

Trade Film Display. Reserved Occupations in the Electrical Industry. E.D.A. Public Speaking Competition. Extensions at Stoke-on-Trent

Film Propaganda

SOME excellent examples of publicity and propaganda films were shown at the Palace Theatre, W.1, on March 30th by Publicity Films, Ltd. Commencing with the E.D.A. film "News by Wire" (one of the three produced last year), the programme covered a wide range of industries and commodities. The vital part played by electricity in the modern car was demonstrated in an interesting fashion in a film made for Joseph Lucas, Ltd., and designed to advertise the company's automobile batteries. The variety of treatment of the various subjects was one of the outstanding features of the display; another was the employment of well-known stage and film actors whose popularity is of considerable assistance in persuading the public to "swallow" this form of propaganda. The company states that it has produced fifty-three films during the past year, including the E.D.A. films and those of the Birmingham Electric Supply Department and Philips Lamps, Ltd., which we have already reviewed.

British Plant for Australia

In the face of strong foreign competition the English Electric Co., Ltd., has received an important contract for power-station plant from the Electric Light and Power Supply Corporation, Ltd., Sydney, for its Balmain power station. The order comprises one 25,000-kW, 3,000-RPM turbo-alternator set for operation at a steam pressure of 1,200 lb. per sq. in., also a smaller unit having an output of 9,375 kW at 3,000 RPM for operation at the same steam pressure as the large set.

Children's Cooking Competition

An electric cooking competition for schoolgirls was arranged recently by the Workington Electricity Department, and the number of entries received was so great that a ballot had to be taken to decide who were to take part. The demonstration room at the electricity showroom was filled with mothers anxious to see how the younger generation adapted itself to the modern method of electric cooking. Each entrant was allotted culinary utensils and a Jackson electric cooker and the test was to make coconut buns from a recipe set by Miss J. Anstey, of the Jackson Electric Stove Co., Ltd. The demonstration proved a great success and was evidence of the fact that the housewife of to-morrow is fully alive to the advantages and cleanliness of electric cooking.

Emergency Reserved Occupations

Amendments to the provisional Schedule of Reserved Occupations which was issued on January 24th have been made and from a list which was issued on March 31st the following relating to electrical and allied occupations has been extracted:—Battery makers (dry); sheet iron workers, sheet metal workers, tinsmiths; cable layers, service layers (electricity), switchboard attendants; copper, lead, zinc, brass, bronze and other alloy manufacture workers; non-ferrous metal manufacture, miscellaneous workers in metal manufacture, rolling and tube drawing, galvanisers, tinners; accumulator and battery makers; stove, grate, range, refrigerator, radiator makers and assemblers.

Irish Electrical Imports

The recently-published trade statistics for February show that in that month Eire imported electrical apparatus and machinery to the following value (figures for the corresponding month last year are in parentheses): Electric motors, £7,029 (£3,251); measuring instruments and apparatus, £926 (£4,916); electrical, other sorts n.e.s., £15,288 (£25,248); power transmission equipment, £802 (£587); dry batteries complete, £703 (£860); parts of dry batteries £58 (£997); electric lamp bulbs, £1,599 (£1,103); electrically heated apparatus and parts (fires, kettles, irons, etc.), £1,891 (£767); electric lighting accessories fittings and parts, £5,773 (£8,934); electric wires and cables, insulated, £7,686 (£9,971); telegraph and telephone apparatus n.e.s., £17,243 (£11,787); electric cooking apparatus and parts, £2,415 (£2,837); other electrical goods and apparatus, £15,310 (£26,136).

Street Lighting Conference

The Conference on Electric Street Lighting to be held at the E.L.M.A. Lighting Service Bureau on May 2nd will bring the latest advances in modern street lighting to the notice of chairmen of street lighting committees, supply authorities and street lighting engineers. Reservations should be made as early as possible as accommodation is strictly limited. Programmes and any further particulars can be obtained from the E.L.M.A. Lighting Service Bureau, 2, Savoy Hill, W.C.2.

Instruments for Battersea

For the boiler house in the new extension of the Battersea power station, the Cambridge Instrument Co., Ltd., has received contracts to supply the multi-point electrical distance thermometer indicating and recording outfits, thermo-electric pyrometers, CO_2 indicator, pressure recorders and an indicator and a recorder for smoke density. For the turbine plant, the company is supplying six 2-point thermo-electric recording pyrometers, each recorder being fitted with internal illumination.

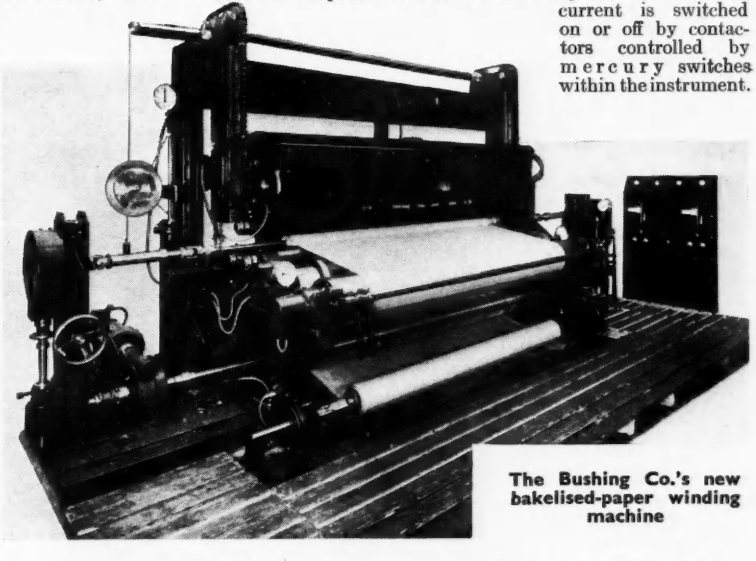
E.D.A. Public Speaking Finals

The E.D.A. public speaking competition which has been in progress for some time in the provinces culminated in the national finals which were held in London at Savoy Hill on March 31st. Thirteen competitors from all parts of the country had been selected; the subjects were "Electricity and Industrial Progress," "Service by Wire," and "What Electricity Will do For a Penny." As in previous years, the standard of the speeches was very high and the method of delivery commendable. The judges were Lord Saltoun, Mr. and Mrs. H. S. Pocock and Miss Gilbert, who adjudicated as follows:—Ladies: 1st, Miss I. J. Ferguson (Clacton Electricity Department); 2nd, Miss D. Millett (Wessex Electricity Co.); 3rd, Miss M. Jackson (Sheffield Electricity Department). Men: 1st, Mr. A. R. Walsh (Hull Electricity Department); 2nd, Mr. Neil Hannah (Glasgow Electricity Department); 3rd, Mr. H. B. Atkinson (Manchester Electricity Department).

Bakelised-paper Insulator Production

A new machine for the winding of high-voltage bakelised paper bushing insulators has been installed by the Bushing Co., Ltd., Hebburn-on-Tyne. This machine embodies a number of improvements and refinements which experience has shown to be desirable, and in addition, being considerably bigger than existing machinery it will extend the range of the company's products and enable it to manufacture insulators of greater length and diameter than hitherto.

The four heating rollers are 3 metres long and are each electrically heated by a 7½-kW element, the temperature being thermostatically controlled within plus or minus 5 deg. C. The temperature control is by Hartmann & Braun and consists of indicating instruments operated by thermo-couples embedded in the wall of the heating roller. The instruments check the temperature of each roller every 30 seconds and the current is switched on or off by contactors controlled by mercury switches within the instrument.



The Bushing Co.'s new bakelised-paper winding machine

Arrangements are made for the continuous indication of the diameter of the winding so that accurate positioning of equipotential layers within the insulator is facilitated; continuous indication of paper tension, winding speed and total pressure is also given. The machine is very rigidly constructed and is fully automatic, the mechanical movements of the machine being operated through hydraulic servo mechanism.

The machine is capable of winding insulators up to a maxi-

mum diameter of 300 mm. which represents a notable advance in the design of bakelised paper insulator winding machines as it enables a more detailed control to be obtained of the winding process.

New L.E.P. Leyland Showrooms

The Lancashire Electric Power Co., has established showrooms in Leyland, the official opening of which took place on March 27th. On this occasion members and officials of the Leyland Urban District Council were the principal guests, and before visiting the showoorms they inspected the company's new main control station at Bow Lane, Leyland. They were then taken by coach to the new showrooms, where Mr.

Mr. C. D. Taite, chief engineer and general manager of the Lancashire Electric Power Co. (extreme left), handing the key to the chairman of Leyland U.D.C., to open the company's new showrooms

C. D. Taite, engineer and general manager, handed the key to the chairman of the Leyland U.D.C. (Mr. A. E. Hocking) and invited him to declare the showroom open. In his response, Mr. Hocking congratulated the L.E.P. on its progress and enterprise. After the company had viewed the new premises, tea was served and an electric clock was presented to Mr. Hocking to mark the occasion. Company officials present included Mr. J. Purrett, asst. engineer and manager, Mr. R. C. Leslie, mains superintendent, and Mr. S. M. Rix, secretary.

Rehousing at Hackney

Attractive facilities for the use of electricity are available at the new King's Mead housing estate just nearing completion at Hackney Wick. Erected by the London County Council at a cost of £550,000, the estate comprises 947 one- to five-room flats arranged in sixteen blocks, the rents ranging from 6s. to 18s. per week. Electricity is supplied under a two-part tariff with a fixed charge based on floor area and a unit charge of ½d. (collected by a shilling prepayment meter). The fixed charge, which is collected with the rent, is only 4d. a week in the case of the smallest flats. Apparatus is obtainable on the following low weekly hire charges: Cooker, 3d., 5d., and 6d., according to size; 1½-gal. water heater, 2d.; wash boiler, 2d.; iron, 1d.; fire, 1d. A flat-bottomed kettle is supplied free with every cooker, but if desired an electric kettle can be had for 1d. a week extra (2d. a week if no cooker is installed). Some of the blocks are equipped with communal wash-houses, where electric wash-boilers are available, prepayment meters being fitted. The electrical installation work for the estate has been undertaken by Meckhonik, Ltd.; Carr Bros.; and Coleby & Co., Ltd.

E.I.B.A. Golf Competition

In addition to the Sir Montague Hughman trophy for the winner of the National Golf Competition being organised by the Electrical Industries Benevolent Association, and the trophies for the winners in each area already promised, numerous other special prizes are to be given. The following are providing these trophies and prizes: Messrs. E. Brook, C. H. Cox, H. A. Deacon, J. H. Farthing, V. Z. de Ferranti, J. Y. Fletcher, Selwyn S. Grant, P. V. Hunter, Lt.-Col. S. E. Monkhouse, Messrs. A. Nichols Moore, James Paterson, Sir Leonard Pearce, Sir Felix Pole, Mr. P. L. Rivière, the "Scottish Electrical Engineer," and the Surrey E.I.B.A. Committee.

Next Year's B.I.F.

The Department of Overseas Trade announces that next year's British Industries Fair will be held in London and Birmingham from February 19th to March 1st. Already, within four weeks of the close of the Fair, 576 exhibitors have applied for 224,313 sq. ft. of space in London and Birmingham in 1940, or more than one-fourth of the area occupied this year.

Trade Announcements

The Birmingham depot of Simpson, Baker & Co., Ltd., has been moved to 269, Broad Street, Birmingham.

The Phosphor Bronze Co., Ltd., has removed its head office to Birch Road, Witton, Birmingham, and has opened separate sales offices at 87, Sumner Street, London, S.E.1, and at Birch Road, Witton, Birmingham, where considerable works extensions have been carried out to supplement the existing works at Aston, Birmingham, and Southwark, London, S.E.1. The offices at 54, St. Thomas Street, S.E.1, have been retained.

The Bushing Co., Ltd., has opened a London office at 8, Fisher Street, Southampton Row, W.C.1 (telephone: Holborn 2133). Mr. W. H. Barnett will be in control of the new branch and will work in collaboration with Mr. Furlong until June 30th when Mr. Furlong will cease to represent the company.

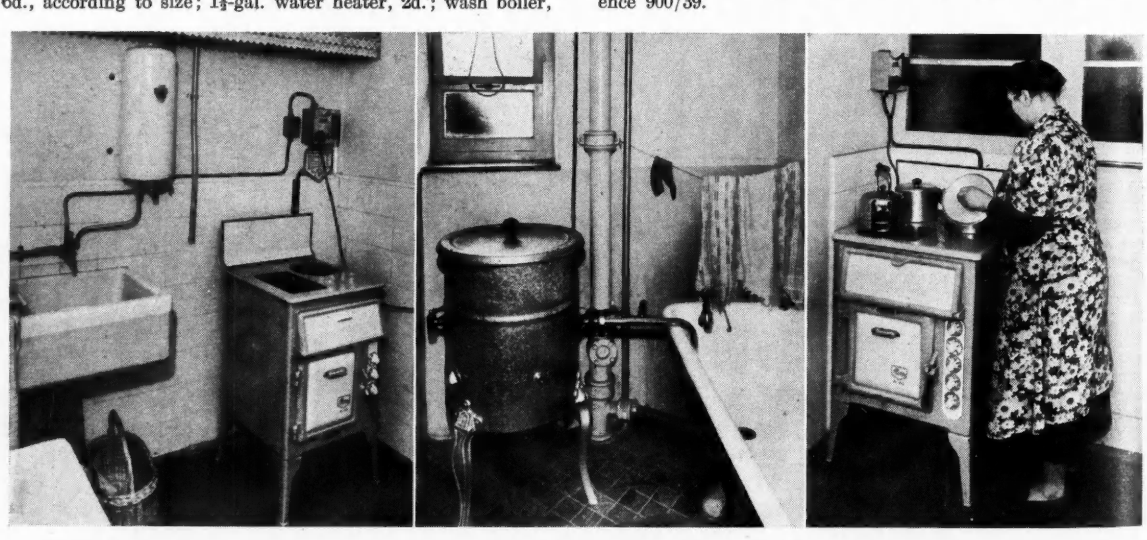
The engineering and gear cutting business of Henry Wallwork & Co. (1920), Ltd., has been acquired by Wallwork Gears, Ltd., whose registered office is at the same address, Red Bank, Manchester, 4. The management is virtually unchanged, but additional plant is being installed and further working capital provided.

New Barnstaple Showrooms

Barnstaple Corporation Electricity Committee has decided to open new electrical showrooms on a site at the High Street end of Barnstaple Pannier Market.

Trade Commissioner's Visit

Mr. J. B. Greaves, H.M. Trade Commissioner at Toronto, will be at the Department of Overseas Trade from April 25th to 28th inclusive, for the purpose of interviewing manufacturers and merchants interested in the export of United Kingdom goods to Canada. Subsequently he will undertake a tour of some of the principal industrial centres in the provinces. Firms who desire interviews with Mr. Greaves in London or wish to obtain information regarding his arrangements to visit the provinces, should apply to the Department of Overseas Trade, 35, Old Queen Street, London, S.W.1, quoting reference 900/39.



Electric cookers, water heaters and wash boilers are much favoured by residents at the L.C.C.'s new King's Mead housing estate at Hackney. Note the dual use of the wash boiler *[Elec. Rev. photos.*

Switches and Plugs

We regret that the references in the text to the illustrations in this article (page 457 of our last issue) did not agree with the numbering on the block, although the inscription was in order. The author stresses that while a sunk type outlet was illustrated he is not in favour of sunk switches, preferring the surface patterns.

Stoke's Electricity Office Extensions

Over two hundred persons, representing all branches of the electrical industry, were present at the official opening of the new extensions to the Stoke-on-Trent Electricity Department's offices (described in last week's issue of the ELECTRICAL REVIEW) and also at the luncheon which followed to mark the Electricity Committee's appreciation of the work of the city electrical engineer, Mr. C. H. Yeaman, in connection with the completion of the change-over from DC to AC and incidentally to celebrate his recovery from his recent severe illness. The inauguration ceremony was performed by Councillor Harry Leason, chairman of the Electricity Committee, who described the objects of the building and paid a warm tribute to the devotion of Mr. Yeaman to his work. As mementoes of the occasion Mrs. Leason and Mrs. Banks (wife of the vice-chairman of the Electricity Committee) were presented with fox furs by the Lady Mayoress on behalf of the contractors, Mrs. Leason also receiving a china tea set from the architects.

The guests were welcomed at lunch by the Lord Mayor, Alderman J. Barker. In proposing the toast of "The Trade and Industry of the City," Mr. Arthur Ellis, consulting electrical engineer of Cardiff, said that the city owed much to Mr. Yeaman, whose health would probably have been a little better if he had not worked so hard for the electricity undertaking. Lt.-Col. W. J. Kent, responding, said that the task of being in charge of an electricity undertaking during the past twenty-five years had been a very difficult one, but their engineer had never hesitated in the development of the Stoke undertaking. A statement regarding the future of the industry would be welcomed from the Government, but there were problems inside as well as outside the industry.

Proposing the health of "Our Guest" (Mr. Yeaman), Councillor Leason declared that no town or city had had a better servant and that he had been responsible for the training of many good electrical engineers. Nine years before the Electricity Commission came into existence he had started a change-over scheme, and the history of the undertaking had been one of continuous progress. He had foreseen the possibilities of using electricity for potteries and there were now twenty-five electric kilns in the area. He was responsible for the erection of all-electric houses and to-day every consumer was benefiting by his actions in the past. Last year 111 million kWh of electricity was sold to 56,263 consumers at an average price of 0.93d. per kWh. Nine thousand electric cookers had been installed and they were now being connected at the rate of 270 a month. The new super power station which the North-West Midlands J.E.A. was about to build would be a godsend to the collieries. In conclusion, Councillor Leason wished Mr. and Mrs. Yeaman health and happiness for many years to come.

On doctors' orders Mr. Yeaman did not reply personally, but Mrs. Yeaman tendered the thanks of both of them for the kindness shown during Mr. Yeaman's illness and for the compliments paid to him. Councillor P. E. Banks, vice-chairman of the Electricity Committee, proposed the health of the visitors, and this was replied to by Messrs. E. N. Scott, J.P., and S. T. Allen, manager for the Central England Area, Central Electricity Board.

Proposed Electrical Registration in Eire

The Government of Eire may be asked shortly to bring in legislation to ensure that only those who are competent should be allowed to trade in or install electrical apparatus. About five years ago a number of the leading Dublin electrical contractors, manufacturers and factors in the industry formed the Society of Irish Electrical Traders. The object was to make some effort to organise the electrical industry with a view to safeguarding the public and improving the conditions under which the electrical trade was carried on. The Society decided to admit no applicants to membership until the Executive Council was satisfied that they were suitably equipped to trade in appliances and carry out electrical contracts.

E.A.W. Activities

Nearly 600 delegates from the North-West England and North Wales Area of the Electrical Association for Women were present at the annual one-day conference held last week at Southport. In thanking the Mayor (Councillor W. Geldard) for an address of welcome, Mrs. V. Z. de Ferranti, who presided, said that if Southport did not have a branch of the Association soon the women of the town would not be able to obtain maids, because the time was coming when maids would demand modern electrical amenities in the homes where they were engaged. A plea for an expression of views at area committee meetings on the educational aspect of the E.A.W.'s work was put forward by Miss M. D. Chorlton, the area organiser, when presenting her report. The following officials were elected for the ensuing year: Chairman, Mrs. Hawkins (Wallasey); vice-chairman, Mrs. L. Carr (Manchester); and treasurer, Miss Edmeston (Eccles and Swinton). Referring to present world conditions, Miss Caroline Haslett, director of the Association, said that they in the E.A.W. were in a real way helping to improve modern conditions and were endeavouring by their work to keep pace with the scientist. An address on "Physical Fitness and Women" was given by Dr. B. M. Butters.

There was also an excellent attendance at the three-day course for senior demonstrators and saleswomen in the electrical industry arranged last week by the Electrical Association for Women in conjunction with the British Electrical Development Association and the Electric Lamp Manufacturers' Association, there actually being an average of over a hundred at each of the sessions. Among the subjects dealt with in the lectures were: "Electrical Service Economics" (Mr. Philip Honey), "The Place of Electricity in Domestic Subjects Teaching" (Miss M. D. Shiell), "The Practical Treatment of Nutrition and Diet in Demonstration Work" (Miss G. Smith), "Display and Window Dressing" (Mr. G. S. Bonney), "Design of Electric Areas as Affected by Commercial Limitations" (Mr. J. I. Bernard), "Home Lighting and its Promotion" (Mr. H. A. Lingard), "Decorative Home Lighting" (Mr. T. O. Freeth), "The Building Centre and its Work" (Mr. W. L. Shand), and "Demonstration Work in the Institution and Commercial Kitchen" (Miss Purvis).

Molybdenum Development

The Climax Molybdenum Co. of Europe, Ltd., was established on March 1st, with offices at 2 & 3, Crosby Square, London, E.C.3. The company has been formed purely as a means of furthering the uses of molybdenum by the dissemination of technical information and co-operative research. Mr. W. F. Rowden is in charge of the company's activities.

A Slough Electrical Association

With the growth of electrical industries on the Slough Trading estate it was felt that an electrical association for the district should be formed to promote the closer study on a wide basis of problems connected with the electrical and radio industries and also to organising such events as lectures, works visits, dinners, dances and socials. The prime mover of the scheme was Mr. E. Page, the local manager of the Sun Electrical Co., and an association has been formed with the title of the Slough and District Electrical Association, of which Mr. Page is the hon. director and secretary. The Association now has 130 registered members and on Tuesday last the inaugural meeting was held at the Old Crown Hotel, Slough. The address of Mr. Page is 39e, Bedford Avenue, Slough Trading Estate, Bucks.

Prices of Materials

Henry Gardner & Co., Ltd., report, April 4th: Copper bars (best selected), sheet and rod, no change. English pig lead, £16 10s., 5s. decrease. Spelter, £13 11s. 3d., 2s. 6d. decrease. English block tin, no change. Mercury, £17, 3s. 6d. increase.

Frederick Smith & Co. report, April 4th: Electrolytic copper bars, £49, 5s. decrease. Ditto, ditto, wire rods, £54 5s., 5s. increase. Ditto, ditto, h.c. wire, no change. Silicium bronze wire, no change.

Edward Till & Co. report, April 4th: India rubber, Para fine, 7d., ½d. decrease.

New Catalogues and Lists

Dorman & Smith, Ltd., Ordsal Electrical Works, Salford, Manchester, 5.—Catalogue No. 132, thumb indexed and containing 75 pages, deals with fuses, distribution boards and accessories.

C. F. R. Giesler, Ltd., 58c, Gray's Inn Road, London, W.C.1.—A leaflet dealing with dynamic balancing and vibration study.

Renold & Coventry Chain Co., Ltd., Renold Works, Didsbury, Manchester, 20.—A folder relating to Renold steel chains.

Drake & Gorham Wholesale, Ltd., 77, Long Acre, London, W.C.2.—A catalogue of vacuum cleaners and floor polishers.

Gilby-Brunton, Ltd., 70, Milton Street, London, E.C.2.—A 40-page catalogue of resistance wires.

L. G. Hawkins & Co., Ltd., 30/35, Drury Lane, London, W.C.2.—Advance details of the "Casco" electric shaver.

Morphy-Richards, Ltd., St. Mary Cray.—Particulars of the "Auto-Control" thermostatically controlled iron.

Superlamp, Ltd., 6, Paul Street, Finsbury Square, London, E.C.2.—A 50-page catalogue of electrical accessories.

Buell Combustion Co., Ltd., 49, Moorgate, London, E.C.2.—An illustrated card drawing attention to the "Micro-Lector" dust separator.

Sturtevant Engineering Co., Ltd., 147, Queen Victoria Street, London, E.C.4.—A well illustrated art catalogue of "Monogram" and other cast iron fans.

Private Arrangements

W. Blakeney, radio engineer, trading as Blakeney's Stores, 108, Botchergate, Carlisle.—The creditors were called together on March 24th when the statement of affairs showed ranking liabilities of £3,131 due to unsecured creditors. In addition, certain discount houses were scheduled as fully secured creditors for £2,885, and they held charges on agreements valued at £3,977. There were also hire-purchase creditors for £180, the securities being valued at £185. The net assets were £946, leaving a deficiency of £2,185. It was decided that a committee should be appointed to consider the matter and recommend the general body of creditors what course should be adopted.

Electro-Horticultural Equipment Co., Ltd., Station Road North, Harpenden, Herts.—A meeting of creditors was held recently at Winchester House, E.C., when Dr. P. Dunsheath,

one of the directors, presided, and a statement of affairs was submitted which showed ranking liabilities of £7,767. The net assets were £1,277, leaving a deficiency, so far as the creditors were concerned, of £6,490.

The company, it was reported, was registered in 1934, with a nominal capital of £1,000. The main object of the company was the manufacture of various types of electrical equipment for use in the horticultural industry. Substantial amounts had been spent by the company in experimenting and advertising and the expenses in that direction were now beginning to show some return. The shareholders had been called together, but had not approved of the voluntary liquidation of the company as it was thought that the business could be carried on successfully in the future. It was believed that additional capital could be obtained and a composition of 5s. in the £ paid to the creditors. During the discussion it was pointed out that certain creditors had commenced proceedings and eventually it was decided that the directors should be requested to take the necessary steps to place the company in voluntary liquidation.

Bankruptcy Proceedings

A. Austen, lately carrying on business as Alfred Austen & Sons, at 109, Headstone Road, Harrow, Middx., electrical contractors and radio dealers.—Receiving order made March 29th on debtor's own petition. First meeting, April 13th, and public examination, May 17th, both at Bankruptcy Buildings, Carey Street, London, W.C.2.

A. Marks, radio dealer, 23, New Street, London, W.C.2.—Receiving order made March 21st on a creditor's petition.

L. F. R. Dean, radio dealer, Stair House Shops, Lamberhurst, Kent.—Receiving order made March 22nd on debtor's own petition. First meeting, April 11th, at 8, Old Steine, Brighton. Public examination, May 3rd, at the Town Hall, Tunbridge Wells.

C. Richmond, electrical and radio engineer, 7, Royd Crescent, Clay Pits Lane, Halifax, formerly carrying on business under the style of C. Richmond & Son, 73, Hanson Lane, Halifax, and 17A. Acorn Street, Halifax. Public examination, May 5th, at the County Court, Halifax.

C. T. Hicks, electrical engineer and contractor, 81, High Street, Witney, Oxford.—Public examination, May 3rd, at the County Hall, Oxford.

R. S. Barlow, electrical contractor and radio dealer, Chapel Lane, Spalding.—Last day for receiving proofs for dividend, April 12th. Trustee, Mr. A. Sutcliffe, Queen Street Chambers, Peterborough.

D. E. Chaplin and **H. J. W. Taylor** (F. B. Chaplin), electrical contractors and wireless dealers, 95, Oxford Street, Bilston.—Last day for receiving proofs for dividend, April 11th. Trustee, Mr. R. K. Clark, 37, Temple Street, Birmingham, Official Receiver.

E. M. Jones, electrical engineer, 26, Eastgate, Aberystwyth.—Receiving order made March 27th on debtor's own petition.

G. A. Wood (A. G. Wood), electrical engineer, 129, Bolton Road, Darwen, Lancs.—Receiving order made March 29th on debtor's own petition.

J. N. Hogg, electrical engineer, 104, Allerton Road, and 16, Woolton Street, Woolton, Liverpool.—Receiving order made March 27th on debtor's own petition. First meeting, April 13th. at Government Buildings, Victoria Street, Liverpool. Public examination, May 16th, at the Court House, Liverpool.

G. Murray, radio dealer, 38, Elmstead Avenue, West Chislehurst, lately carrying on business at 119, High Street, Orpington, Kent.—Receiving order made March 27th on a creditor's petition.

W. F. Buttery, electrical contractor, 293, Tong Street, Dudley Hill, Bradford.—Trustee, Mr. W. F. Cresswell, Official Receiver, 71, Manningham Lane, Bradford, released March 24th.

A. C. Hall, electrician, 65, St. Thomas's Road, Worthing.—Trustee, Mr. V. R. Fletcher, 8, Old Steine, Brighton, Official Receiver, released March 24th.

J. C. N. Eastick and **L. E. K. Eastick** (J. J. Eastick & Sons), wireless factors, 118, Bunhill Row, London, E.C.1.—First and final dividend of 5s. 6d. in the £, payable April 28th, at 11-12, Finsbury Square, London, E.C.2.

A. W. Sadler, radio engineer and dealer, 115, Osmaston Road, Derby.—First and final dividend of 1s. 1½d. in the £, payable March 22nd at 22, Regent Street, Park Row, Nottingham.

Company Liquidations

Douglas Keith, Ltd., radio dealers, 136, Mitcham Road, Tooting, and elsewhere.—The first meetings of creditors and shareholders were held under the compulsory liquidation of this company on March 30th at the Board of Trade offices, Carey Street, W.C. Mr. C. W. Bird, Assistant Official Receiver, reported that a statement of affairs showing the position as at January 5th, 1939, when a receiver was appointed for the debenture holder, disclosed total liabilities of £8,686, of which £3,271 was unsecured and £3,779 due on debentures. The assets were valued at £3,406 and were totally absorbed by the preferential and debenture claims. The company was formed in October, 1933, with a capital of £1,500, to carry on business as wholesalers, retailers and dealers in electric incandescent lamps, electrical accessories, &c., but the primary object was to open a number of shops to engage in retail sales, particularly relating to wireless. The business was almost entirely confined to the sale of wireless sets and accessories. The failure of the company was attributed to lack of working capital, bad trade, general deterioration in the radio trade during the last few years, and inability of the company to offer the same facilities or terms for hire-purchase as those offered by multiple radio stores. A resolution was passed for Mr. N. W. Osborne, C.A., of London, to act as liquidator with a committee of inspection.

"Beeantee" Illuminations, Ltd.—Winding up voluntarily. Liquidator, Mr. B. Leigh, 186, Bishopsgate, London, E.C.2.

Dissolution of Partnership

Wallace Cook & Co., radio and electrical engineers and dealers, 34, Green Lane, Northwood, Middx.—Messrs. R. F. Lovegrove and W. Cook have dissolved partnership. Mr. Lovegrove will attend to debts and carry on the business.

Information Department

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, &c., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

METAFIX plugs.

U.S. Electrical Exports Decline Last Year

REDUCED shipments of radio material were largely responsible for the fact that the total exports of electrical equipment from the United States last year fell in value by $10,458,000. The aggregate was $102,151,000, compared with $112,609,000 in 1937. Exceptions to the fairly general setback were turbine sets, heavy motors, searchlights, airport beacons, washing machines, industrial heating apparatus and razors. No information is forthcoming yet regarding the relative value of the different foreign markets for American electrical goods: for such detail the annual statement of trade for 1937 is still awaited. The following table, based on the monthly return for December and the twelve months, gives the export values for 1938 with a note of increases or decreases compared with 1937.

	1938 $ (000)	Inc. or dec. on 1937 $ (000)
Generators, DC	358	− 154
Generators, AC	691	− 376
Steam turbine generator sets	1,382	+ 1,039
Accessories and parts for generators	663	+ 73
Arc welding sets	1,069	+ 9
Self-contained lighting outfits	1,452	− 323
Wind-driven generators	414	*
Batteries, 6 and 12 V storage	1,487	− 341
Other storage batteries	708	− 287
No. 6 dry-cell batteries	169	− 57
Flashlight batteries	1,976	− 840
Radio B. and C. batteries (dry)	314	− 202
Other dry and wet cell primary batteries	173	− 16
Power transformers, over 500 kVA	443	+ 6
Distribution transformers, 500 kVA and less	722	+ 73
Instrument transformers	138	+ 16
Other transformers	462	+ 40
Complete battery chargers, non-rotating	231	− 3
Double-current and motor generators, dynamotors, synchronous and other convertors	755	+ 69
Switchboard panels, except telephone	637	+ 78
Power switches and circuit-breakers over 10 A	1,802	+ 310
Fuses	176	− 17
Watt-hour and other measuring meters	573	− 199
Indicating instruments	870	+ 62
Recording instruments	284	− 57
Other electrical testing apparatus	1,320	+ 93
Lightning arrestors, choke coils reactors and parts	696	+ 56
Motors, ¼ H.P. and under	779	− 104
Motors, over ¼ and under 1 H.P.	273	− 73
Stationary motors, 1–200 H.P.	1,481	− 358
Stationary motors, over 200 H.P.	500	+ 217
Railway motors	160	− 145
Elec. locos., railway, mining and industrial	752	− 93
Station and warehouse motor trucks	409	+ 146
Starting and controlling equipment for industrial motors	1,395	− 150
Starting and controlling equipment for traction motors	235	− 29
Portable electric tools	1,335	+ 103
Accessories and parts for motors	1,614	− 319
Elec. refrigerators, household	10,768	− 2,003
Ditto, commercial up to 1 ton	1,914	− 566
Elec. refrigerator parts	5,233	− 187
Flashlight cases	672	− 246
Fans	645	+ 22
Lamps for automobiles, flashlights and Christmas trees	358	− 90
Other metal-filament lamps	887	− 64
Other electric lamps	86	+ 36
Searchlights and airport beacons	517	+ 465
Floodlights	146	− 11
Household washing machines	2,630	+ 529
Ditto, parts	166	+ 34
Domestic vacuum cleaners	560	+ 31
Ditto, parts	284	− 63
Other domestic motor-driven devices except tools	691	− 116
Flat-irons	324	− 18
Cooking ranges	347	− 53
Heaters and ovens	161	− 3
Other domestic electric utensils	543	− 9
Industrial furnaces, ovens and other heating devices	2,107	+ 1,271
X-ray tubes	330	− 5
Other X-ray apparatus and parts	1,249	− 77
Other therapeutic apparatus	412	+ 51
Radio transmitting sets, tubes and parts	2,958	+ 274
Receiving sets	10,551	− 5,578
Receiving tubes	2,973	− 1,090
Receiving set components	5,413	− 2,044
Loudspeakers	680	− 208
Other receiving set accessories	524	− 357
Telegraph apparatus	343	− 160
Telephone instruments	180	− 81
Other telephone equipment	3,555	+ 534
Bells, buzzers, annunciators and alarms	257	+ 32
Starting, lighting and ignition equipment	1,245	− 192
Insulating material	290	− 122
Metal conduit, outlet and switch boxes	900	− 183
Sockets, outlets, fuse blocks and lighting switches	1,233	+ 212
Interior lighting fixtures	1,187	+ 44
Exterior lighting fixtures	226	− 6
Other wiring supplies and line material	943	− 76
Electric razors	1,059	+ 862
Other electrical apparatus	7,711	+ 200

* Comparative figures not available.

ELECTRICITY SUPPLY

Falkirk Centralised Control System. Commercial Use for Power Station Ash at Leicester. Measures to Minimise Risk of Failures at Lytham St. Annes and Wallasey

Barking.—Aluminium Kettles on Hire.—Consumers have asked for aluminium kettles to be hired with cooker installations instead of the copper kettles at present supplied and the Electricity Committee has agreed that in future new consumers shall be given the choice. Where it is desired to change a copper for an aluminium kettle a fee of 7s. 6d. is to be charged.

Bradford.—New Cables.—The Electricity Committee is to lay 33-kV cables from Valley Road power station to Eccleshill at a cost of £50,743.

Cardiff.—Mains.—The Electricity Committee is to complete the ring main at a cost of £99,225, and is seeking sanction to borrow £50,000 for mains and services.

Cheltenham.—Better Lighting.—The lighting in London Road and High Street is to be improved by the Electricity Committee at a cost of £1,378.

Derwent.—Proposed Extension.—The North Lincolnshire & Howdenshire Electricity Co., Ltd., is considering affording a supply of electricity to Skipworth and Thorganby.

Eastbourne.—Switchgear Improvements.—A complete survey of the high-voltage switchgear, with a view to the provision, where necessary, of up-to-date switch and protective gear, has just been completed. The Electricity Committee reports that the survey involved very considerable technical investigation, and as a result it is estimated that an expenditure of £27,973 will be necessary.

Loan.—The Electricity Committee is seeking sanction to borrow £10,000 for cookers, water heaters and other electrical apparatus.

Erpingham.—Supply to Weybourne.—The East Anglian Electric Supply Co., Ltd., is planning to afford a supply of electricity to Weybourne.

Falkirk.—Street Lighting Control.—The first installation in Great Britain of "Rythmatic" control was put into service in Falkirk on March 27th. This method of control, the most

Provost Begg inaugurating the "Rythmatic" control at Falkirk

recent development of Automatic Telephone & Electric Co., Ltd., is designed to enable numerous public services to be controlled from one central point by means of push buttons. Up to twenty-four different switching operations are possible and the services to be controlled can be selected to suit local requirements. At Falkirk, some 400 lamps are controlled and they can be simultaneously switched "on" at dusk; "off," except for pilot lamps, at midnight; and completely "off" at dawn. While other services such as electric water heating and space heating, &c., can be controlled, if required, of particular importance is the ability of the apparatus to handle numerous A.R.P. services such as the calling-up of wardens, nurses, firemen and the like. At Falkirk it is anticipated that in the near future the firemen call facility will be equipped and operated from the fire station for calling-up firemen from their houses. Provision is also made on the Falkirk system for the sounding of sirens. The installation was hastened so that it could be used in connection with the extensive East Scotland "blackout," which actually commenced an hour or so after the inauguration of the system was performed by Provost Begg in the presence of Councillor Murdoch, chairman of the Electricity Committee, other members of the Town Council, and Mr. T. Climie, the electrical engineer. At the commencement of the "blackout" at 10 p.m. the "dawn" button was pressed and immediately every street lamp was extinguished.

Hawarden.—Factory Supply.—The Rural District Council proposes to lay electricity mains to the Air Ministry factory at Broughton.

Heston and Isleworth.—New Sub-station.—The Town Council is to erect an electricity sub-station at Harlequin Avenue, Great West Road, Isleworth.

Ipswich.—Street Lighting.—When the Town Council was asked to sanction the second year's proposals for street lighting improvements at an estimated cost of £4,000 it was decided to reduce the expenditure to £1,500 this year, the scheme to include Norwich Road (Bramford Road to the borough boundary), Wherstead Road, Vernon Street, Bridge Street, St. Peter's Street, St. Nicholas Street, and Queen Street.

Isle of Man.—Sulby Hydro-electric Scheme.—A question was recently asked in the Tynwald whether the Electricity Board had under consideration the installation of a hydro-electric plant on the Sulby River. The Governor replied the matter was under consideration, but no conclusion had yet been reached.

Johnstone.—Street Lighting.—A proposal to make a change-over from gas to electric lighting in the principal thoroughfares of Johnstone was made at a meeting of the Lighting Committee last week. It is estimated that the scheme will cost about £6,000.

Kingsbury.—Sub-station.—The North Met. Electric Power Supply Co., Ltd., is to erect a sub-station in Bacon Lane.

Leicester.—Utilising Power Station Ash.—The use of powdered ash from the electricity generating station for the manufacture of concrete will save the Corporation several thousands of pounds a year. The Electricity Committee has made arrangements with Vitreous Concrete, Ltd., who will erect buildings on land adjoining the station and take the powdered ash, not less than 15,000 tons and not more than 30,000 tons a year, for the manufacture of concrete pipes and a new kind of brick. The Corporation will pay the company 3s. a ton, compared with the 6s. per ton which is paid at present for the removal of the ash.

Lytham St. Annes.—Duplicate Switchgear.—The Council has decided to make an application to borrow £41,460 to cover the cost of duplicate switchgear and regulators. The suggested scheme detailed in a report by the electrical engineer (Mr. J. C. Fairchild) is an outcome of the "black-out" some time ago affecting the electricity supply from Preston to the Fylde coast.

Macclesfield.—Extension.—The Electricity Committee has granted permission to the Electricity Co. of Macclesfield, Ltd., to extend the mains to Bosley.

Middlesex.—Electricity in Agriculture.—The County Council Agricultural Committee has sent a resolution to the Ministry of Agriculture and Fisheries and also to the County Councils Association and the Council of Agriculture for England, calling for an adequate and economic supply of electricity in rural areas as a safeguard against a shortage of oil during war time.

Porlock.—Public Lighting.—The Council has accepted the tender of the Minehead Electric Supply Co., Ltd., for a seven years' contract for street lighting in the village.

Rothbury (Northumberland).—Electric Washboilers.—The Rural District Council has agreed to a recommendation to install electric washboilers in houses at Elsdon.

St. Helens.—Proposal to Merge Gas and Electricity Committees.—The Finance Committee has recommended the ap-

I.M.E.A. Convention

THE programme of the annual Convention of the Incorporated Municipal Electrical Association at Harrogate (June 5th-9th) will be in the hands of members in the course of a week or so. The following papers are to be read:—

June 6th. "The Technical Side of Electricity Distribution," by Messrs. P. J. Robinson and E. L. Morland.

June 8th. "Advertising and Publicity," by Mr. A. C. Cramb; and "Air Raid Precautions and Electricity Undertakings," by Mr. J. M. Kennedy.

The ordinary general meeting will be held on June 9th. Trips have been arranged for the afternoon but the meeting will be continued after lunch if the members so desire.

pointment of a special committee to consider the advisability, on financial grounds, of the fusion of the Gas and Electricity Committees. At a recent meeting of the Town Council, Alderman J. Hewitt (chairman of the Electricity Committee) moved that that minute should be deleted. The matter was taken back for further consideration.

Swansea.—BOILER PLANT AT TIR JOHN.—Mr. John Bruce, the consulting combustion engineer, informed the Electricity Committee last Friday that he regarded the success attained by the Boiler Construction Co. with the Tir John boilers, in view of the revolutionary departure in the fuel (anthracite duff) employed, as having been commendable. The experience with these boilers, he said, had been such that it was now possible to design two boilers that should give, with pulverised fuel, as good a performance as bituminous coal-fired boilers. In his view the boiler plant and the associated equipment was designed too "skimpily," consequently he had designed to incorporate 5,000 more square feet of heating surface per boiler; it should therefore steam comfortably to the new maximum continuous rating of 230,000 lb. of steam per hour, and still produce an additional 50,000 lb. of steam per hour when needed. In the design he had met the new condition that the boilers should be capable of six months' continuous maximum production. The Committee agreed to sign the contracts for the two new boilers already recommended so as to increase the output of the station.

Thetford.—LIGHTING CONTRACT.—Both the British Gas Light Co., Ltd., and the East Anglian Electric Supply Co., Ltd., are to be asked to tender for the lighting of the town as from the end of the current lighting contract in August.

Thingoe.—RURAL EXTENSIONS.—The East Anglian Electric Supply Co., Ltd., is to afford a supply of electricity to Sicklesmere and Great Whelnetham.

Wallasey.—ADDITIONAL POINT OF SUPPLY.—The Electricity Committee has approved a scheme for an additional point of supply from the grid at a total estimated cost of £31,053.

CABLES AND SWITCHGEAR.—Cables are to be laid from the Seaview Road sub-station to Grosvenor Road and the baths sub-stations. Additional switchgear is to be provided at a cost of £5,507.

Overseas

Ethiopia.—NEW POWER STATION AT ADDIS ABABA.—A power station has been constructed at Addis Ababa in which local resources, such as charcoal, will be used, states *Reuter's Trade Service*. Large quantities of umbelliferous acacia trees will be used for producing the charcoal, which in its turn will produce gas for operating three 350 kW sets. According to reports from Addis Ababa, thirteen new transforming stations have been installed. There are about 37½ miles of low-voltage and 13½ miles of high-voltage cables for the distribution of electricity in Addis Ababa, and a number of other sections are being installed.

France.—GOVERNMENT CONTROL OF HIGH-VOLTAGE NETWORK.—A decree of the Minister of Public Works has declared all electric lines capable of transmitting at 150 kV or more are "to be grouped for unified control as a very high voltage network for electrical transmission." Control covers all lines and line constructions, sub-stations, switch stations, and other equipment and it is understood that the purpose is to permit the Government to utilise the system for any purpose required for national defence.

DEVELOPMENT OF ELECTRIC COOKING.—Figures collected by the Société pour le Developpement des Applications de l'Electricité on the development of electric cooking show a considerable improvement last year. The total number of appliances in use in France and the North African colonies was 240,500 in 1938 against 196,000 in 1937 and 160,000 in 1936.

India.—COCHIN HYDRO-ELECTRIC SURVEY.—The Cochin Government proposes to undertake a detailed examination of the hydro-electric resources of the Poringal Kuthi waterfalls on the Chalakundi River. There was an investigation in 1915 at the instigation of the then Diwan (Sir Joseph Bhore) when it was considered to be a "most hopeful project."

Russia.—LARGE NEW HYDRO-ELECTRIC POWER STATION.—Preparatory work for the building of a big hydro-electric power station on the River Oka, near Kaluga, one of the major construction schemes of the third five-year plan, is now practically completed. The projected power station will have a capacity of 150,000 kW. A dam will divide the waters of the Oka near the village of Vorovaya and create a reservoir covering an area of 980 square kilometres, with an average depth of eight metres.

At present the upper reaches of the Oka are practically unnavigable owing to shallows and numerous sandbanks, but with the building of the projected hydro-electric power station the level of the water at the dam will be raised twenty-eight metres and the head thus formed will spread over a stretch of 200 kilometres and make the upper reaches of the Oka navigable for big ships. The principal tributaries of the Oka, the rivers Zhizdra, Ugra, Upa and Zusha, will also become navigable over a considerable stretch. The building of the Kaluga hydro-centre will complete the circular water route Gorky, Rybinsk (along the Volga), Moscow, Volga Canal, Moscow River, Oka River and Gorky. The cost of the new power station, which will take approximately four years to build, is estimated at 575 million roubles.

UNDERGROUND POWER STATION.—Substantial progress has been made in the building of the underground hydro-electric power station on the Niva River, in the Kola Peninsula. The new station, to be known as Niva 3, has a projected capacity of 150,000 kW and will be a source of supply of cheap energy for the Nickel Combine at Monchegorsk and the Aluminium Works at Kandalaksha. The station will have four turbo-generators each of 37,500 kW, which will be installed in a machine-room 246 ft. below the surface of the ground. The water for the turbine will pass through a tunnel 1¾ miles long and 28 ft. high, cut through solid rock (half a mile of this tunnel has already been cut). From the turbines the water will be sent along a second tunnel into Kandalaksha Bay, in the White Sea. Unlike other hydro-electric power stations in the Soviet Union, Niva 3 will be able to work at full capacity all the year round; in winter water will be drawn from the big lakes at the Niva's source. A staff of 3,000 workers and 400 enginers, technicians and clerks is engaged in building the station.

Sicily.—HYDRO-ELECTRIC DEVELOPMENTS.—In a recent issue of *L'Energia Elettrica* particulars are given of a scheme of the Societa Generale Elettrica della Sicilia for developing the hydro-electric resources of the River Sosio. The plan embraces the construction of two power stations, one of which, known as the San Carlo, has recently been completed. The second, the Poggio Diana, which will operate under a head of 308 ft. and be capable of an annual output of 14 million kWh, is in course of construction. The San Carlo plant, which has necessitated the construction of a curved dam 328 ft. in width and 105 ft. in height, comprises three 2,250-kW Pelton-type turbines and generators.

Sweden.—NEW POWER STATION.—A hydro-electric power station of about 100,000 kW is to be constructed on the Järpströmmen, a river running between lakes Kallsjön and Storsjön in the Indalsälven river system, reports *Reuter's Trade Service* from Stockholm. The waterfall to be harnessed has a height of about 210 ft. and is partly owned by Stockholm Muncipality and partly by the Swedish Government. The cost of the new station is estimated at Kr. 29,500,000 and construction could be completed in 5½ years.

COMMUNICATIONS

Canada.—TELEPHONE PROGRESS.—According to *Agricultural and Industrial Progress in Canada*, the number of telephones in use in the Dominion at the end of 1937, the latest year for which official figures are available, was 1,322,794, as compared with 1,266,228 at the close of 1936, the number of instruments in use for each 100 of the population rising during the twelve months from 11.48 to 11.89. Of the total, 613,027 instruments were of the automatic type, an advance of about 9 per cent. during the year.

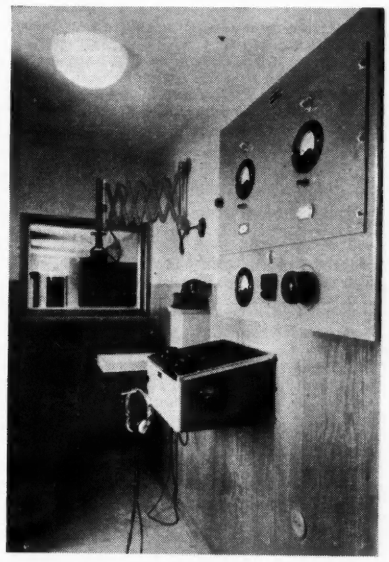
Great Britain.—25-YEAR-OLD TRANSMITTER BEING DISMANTLED.—The long-wave wireless station at Caernarvon, completed in 1914, is being dismantled by Thos. W. Ward, Ltd. Preliminary tests were being made with America when war broke out. Situated on the western side of Cefn-du, one of the lesser heights of Snowdonia five miles to the east of Caernarvon, the station has been a prominent landmark for nearly twenty-five years, being visible from Anglesey across the Menai Straits. The aerials are on ten tubular masts each 400 ft. high and 3 ft. 6 in. diameter at the bottom, and six 400-ft. lattice masts, which slope gradually up the mountain side. The apex of the topmost mast is 1,800 ft. above sea level. The original aerial was 3,900 ft. in length and a second was added subsequently.

During the war the station passed under the control of the Post Office for war purposes and was used for both transmitting and receiving. At the time of its construction it embodied the latest knowledge in wireless technique and engineering, and a record of the changes and extensions would indicate the various stages in the progress of long-wave transmission. Every type of transmitter from synchronous to water-cooled-valve, was in turn tried out. Latterly, the station has been used for transatlantic traffic and subsidiary services in European and other countries. It was also extensively used for the transmission of pictures to America. Letters could be flashed across the Atlantic at 100 words per minute. On September 22nd, 1938, the first message ever sent to Australia was successfully sent from Caernarvon.

TELEPHONE PROGRESS.—In the Leeds area the number of calls rose from 44,981,860 in 1937 to 46,828,273 in 1938. A new automatic exchange was opened at Barwick-in-Elmet, and additional plant was provided at eight automatic stations and twelve manual exchanges. The Leeds exchange switch-room was considerably enlarged, and surveys were completed for new telephone cables from Leeds to Bradford and Huddersfield.

Russia.—BUOY EQUIPPED WITH RADIO.—For the systematic collection of data on the drift of ice in the polar basin Professor Wiese has suggested the use of a buoy equipped with radio apparatus to indicate its position as it drifts along with the ice. The Soviet Arctic Research Institute is holding a competition for the best design of buoy of this type.

Switzerland.—A LARGE SOUND DISTRIBUTION SYSTEM.—The sound distribution installation provided by Messrs. Philips in the League of Nations building at Geneva is claimed to be the largest in Europe. It enables speeches delivered in either the Assembly Chamber or in a small meeting room to be heard in any part of the building, and at the same time they are transmitted to the two radio broadcasting stations of the League, as well as to any foreign stations which may desire to broadcast them. In addition the installation provides for radio-commentator descriptions of the sessions, and for cinematograph operators who wish to take their sound registrations from the microphone system. The installation is controlled from a central office through which all the lines of the system pass. Ribbon microphones are used, five being installed in the Assembly Hall and four in the small meeting room. In order to avoid difficulty in mixing the outputs from these microphones each is provided with a pre-amplifier which raises the volume of the sound sufficiently to prevent the operation of the mixing potentiometers being heard. Radio commentaries are broadcast from special cabins, others being provided for cinematograph operators. The signalling system for co-ordinating the operation of the whole system is similar to that generally used in broadcasting stations.

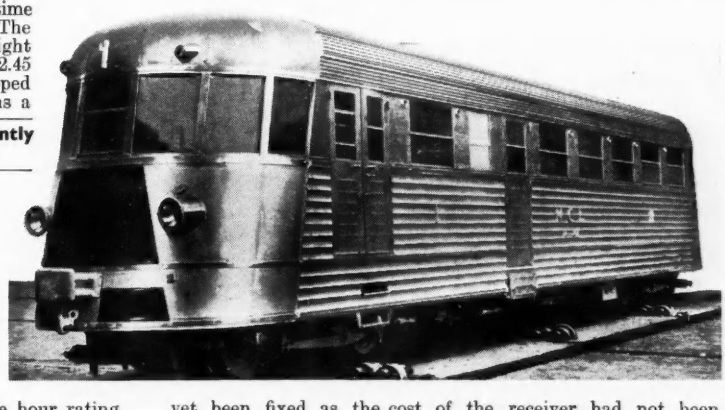


Radio commentators' room at the League of Nations building, Geneva

TRACTION

Birmingham.—TRAM ROUTES DISCONTINUED.—Buses were substituted for trams on routes between Birmingham, Handsworth, West Bromwich, Dudley, and Wednesbury last Sunday. One hundred trams which have been operating the routes were replaced by 117 buses. The most modern of the displaced trams will be transferred to the city's remaining tram routes, and the oldest vehicles will be scrapped.

Italy.—NEW DIESEL-ELECTRIC RAILWAY COACHES.—A series of Diesel-electric railway coaches with uncommon features has recently been put into service in Italy. The routes served include gradients of as much as 6 per cent., and for this reason the four-axle coaches are designed to operate without trailers. Each of the two bogies carries a complete Diesel-electric engine with its water cooling plant and radiator, the generator and driving motor. In order to provide space for all this plant the pivot socket is placed behind the centre. The Diesel generator set is supported on the bogie by "Silentbloc" sets while rubber blocks are also placed under the springs, pivot and lateral coach-body carriers to absorb vibration. The method of building the bogies as complete engine units permits the plant to be installed or removed as a whole with the minimum of time lost in case replacements become necessary. The bodies are of stainless steel, spot welded, and light in weight. They are 15.6 metres long and 2.45 metres wide, and the total weight fully equipped is only 5 tons, while each of the bogies weighs a little over 2.5 tons. The Diesel engine is a six-cylinder, four-stroke type with a continuous rating of 127 HP at 1,600 RPM. The generator is rigidly coupled to the end of the engine crankshaft and is designed for use either as a generator or for starting the Diesel engine, in which case it acts as a series-wound motor driven by storage batteries. In case of the breakdown of one of the generators or of the engine driving it, the remaining generator can be used to feed the driving motors of the two bogies. Each generator is of 86 kW at 320 V and 270 A, one hour rating, or 195 A at 440 V continuous; maximum voltage, 500 V. Auto-excitation and separate excitation are provided, as well as a counter-compound winding to limit the current surge at starting. The motors are self-cooled, nose-suspended, with armatures on roller bearings. They are designed for a one-hour rating of 74 kW at 320 V and 254 A at 1,470 RPM. The maximum speed is 2,940 RPM, corresponding to a track speed of 75 kilometres per hour. In order to avoid the need for auxiliary generators a voltage convertor set is installed.



One of the new Diesel-electric coaches recently put into service in Italy

Glasgow.—RAILWAY ELECTRIFICATION.—The Corporation last week approved a memorandum dealing with schemes of public work which might be undertaken for the relief of unemployment. The schemes proposed included electrification of the district railways and the routes to the Ayrshire coast.

RADIO RELAYS

Post Office Proposals

AMBITIOUS proposals for a State radio-relaying system were announced by the Postmaster-General (Major Tryon) in the House of Commons last week.

He recalled that the Ullswater Committee on Broadcasting recommended, with one dissentient, that the ownership and operation of the relay companies' services should be taken over by the Post Office. The Government decided, however, that the companies' licences should be extended for three years—that was, to December 31st, 1939—and that during that period the Post Office should undertake technical research and practical experimental work in the distribution of broadcast programmes by wire.

As a result of these investigations the conclusion had been reached that there was scope for the provision of services by two systems—a service by the relay companies and a Post Office service by "carrier" frequency over telephone lines—and the Government had decided that the public interest would be best served by the development of both these systems.

The relay companies' licences would be extended for a further period of ten years to December 31st, 1949, subject to certain modifications regarding the programmes supplied to subscribers and the control of the exchanges in time of emergency. Licences granted to new companies would be terminable on the same date and would be subject to similar conditions.

In addition, the Post Office would introduce a service for the distribution of broadcast programmes over telephone lines. It would be possible to give a choice of three or four programmes, including the National and the Regional, and a subscriber would be able to use his telephone simultaneously with the reception of a broadcast programme. The service would, he hoped, be started this year in a few districts and would be extended later. The charges and other details would be announced in due course.

The service would at the outset be restricted to telephone subscribers; and although it was contemplated that it might eventually be extended to non-telephone subscribers, this question would be left over for decision at a later stage after sufficient experience had been obtained of the new service.

The new licences issued to the relay companies would provide that in time of emergency the companies should transmit any special announcements ordered by the local A.R.P. or police authorities. Power would also be taken in the licences to require the relay exchanges to be connected by wire with a B.B.C. station, thus enabling programmes to be transmitted, if so desired, entirely by wire. These arrangements, which would be adopted also in the new service by telephone, would be of advantage from the point of view of national defence, as although it was the intention that broadcasting should be continued in the event of war, the service would be liable to deterioration or interruption from which a wire service would be immune.

In reply to questions Major Tryon said that the Post Office service would not exclude areas in which relay companies were operating. No scale of charges to telephone subscribers had yet been fixed as the cost of the receiver had not been ascertained.

Owing to the importance of the proposed service from the point of view of national defence and safety they were very anxious to institute it as quickly as possible.

FINANCIAL SECTION

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

G.E.T. Installation Co., Ltd.—Private company. Registered March 29th. Capital, £500. Objects: To acquire the business of G.E.T. Installation Co., carried on by Geo. E. Tucker at 8, High Street, Croydon, Surrey, and to carry on the business of electrical engineers and contractors, &c. Directors: G. E. Tucker, 13, Headley Avenue, Wallington, Surrey, and H. S. Rubin, 42, Berkeley Court, Baker Street, N.W.1. Registered office: 1, Bloomsbury Street, W.C.1.

R. N. Fitton, Ltd.—Private company. Registered March 27th. Capital, £15,000. Objects: To acquire the business of a manufacturer of radio receiving apparatus carried on by R. N. Fitton. Permanent directors: R. N. Fitton and R. S. Fitton, both of 39, Garden Road, Brighouse. Registered office: Hutchinson Lane, Brighouse, Yorks.

D. L. Chittenden, Ltd.—Private company. Registered March 25th. Capital, £1,000. Objects: To carry on the business of electrical and general contractors, and radio and television dealers, &c. Directors: D. L. Chittenden (permanent), 61, The Broadway, Chesham, and Mrs. E. V. Chittenden, "Clovelly," Chartridge Lane, Chesham. Secretary: L. Millns.

New Hearing, Ltd.—Private company. Registered March 27th. Capital, £500. Objects: To carry on the business of electrical and mechanical engineers, manufacturers of and dealers in devices for the recording or amplification of sound, &c. Subscribers: C. H. Dingley, 115, Bowyer Road, Alum Rock, Birmingham, and Miss E. J. Davies, 129, Oakwood Road, Birmingham, 11. Registered office: Prudential Buildings, Colmore Row, Birmingham.

Plusagram, Ltd.—Private company. Registered March 28th. Capital, £100. Objects: To acquire the trade mark "Plusagram," and to carry on the business of manufacturers of and dealers in radio and electrical apparatus and accessories, gramophones, &c. Permanent directors: A. Margolin, 37, Burbage Road, S.E.24, and J. Margolin, 138, King's Avenue, S.W.12. Registered office: 22, Basinghall Street, E.C.2.

J. Karet & Co., Ltd.—Private company. Registered March 27th. Capital: £2,000. Objects: To acquire the stock-in-trade and goodwill of the business of J. Karet & Co., carried on by Mrs. Ray Karet at 202, Bow Road, E., and to carry on the business of electrical and general engineers, &c. Directors: J. Karet, engineer (permanent governing director) and R. Karet, both of 84, Baxter Avenue, Southend-on-Sea. Acting secretary: S. Seifert. Registered office: 62/4, Great Eastern Road, Stratford, E.15.

Midland Neon, Ltd.—Private company. Registered March 22nd. Capital, £500. Objects: To carry on the business of manufacturers, designers and erectors of advertising and display signs, &c. Directors: F. A. Bendall, Greswolde Hotel, Knowle, and H. K. Houghton, 51, Church Lane, Coventry. Registered office: 11, Albert Street, Birmingham.

Fitzroy Radio, Ltd.—Private company. Registered March 24th. Capital, £100. Objects: To carry on the business of manufacturers, importers, exporters, buyers and sellers of and dealers in radio and television equipment, &c. Subscribers: A. F. A. Powles and E. Vershuys, both of Amberley House, Norfolk Street, W.C.2. Registered office: 24, Fitzroy Square, W.1.

Jillkelly, Ltd.—Private company. Registered March 24th. Capital, £100. Objects: To carry on the business of lamp and lampshade manufacturers and dealers, &c. Directors: O. F. Kelly, 339, Finchley Road, N.W.3; and E. A. Welsh, 34, Taymount Grange, Taymount Rise, S.E. Registered office: 2, Baker Street, W.1.

Grant Switchgear, Ltd.—Private company. Registered March 20th. Capital, £1,000. Objects: To carry on the business of manufacturers of and dealers in automatic switchgear, &c. Permanent directors: H. B. Grant and A. D. S. Goldsman, both of 207, Lavender Hill, S.W.11. Registered office: 207, Lavender Hill, S.W.11.

Rands & Co., Ltd.—Private company. Registered March 21st. Capital, £2,000. Objects: To carry on the business of electrical wholesalers, retailers, merchants, engineers and manufacturers, electricians, mechanical engineers, &c. Directors: E. R. Mayer, Bellasis House, near Dorking; R. Bushby, 90, Links Road, Ashtead, Surrey; and E. C. Brown, 100, Beachmount Avenue, Hanwell, W.7. Secretary: R. Bushby. Solicitors: Longbourne, Stevens & Powell, 7, Lincolns Inn Fields, W.C.2. Registered office: Abbey House, 2-8, Victoria Street, Westminster, S.W.1.

Kenselectric, Ltd.—Private company. Registered March 20th. Capital, £100. Objects: To carry on business as manufacturers, importers and exporters of and dealers in electrical and general plant, equipment and accessories, &c. Directors: V. Zacharof and M. Kanshin, both of 52, Earls Court Road, Kensington, W.8. Registered office: 52, Earls Court Road, W.8.

Civic Radio Services, Ltd.—Private company. Registered March 22nd. Capital, £2,000. Objects: To carry on the business of manufacturers, agents for and dealers in gramophones and sound-reproducing machines and radio apparatus, electricians, radio and electrical engineers, &c. Directors: T. Williamson, 73, Willows Road, Cannon Hill, Birmingham, and two others. Registered office: 3, Easy Row, Birmingham.

Rugby Electrical Engineering Co., Ltd.—Private company. Registered March 22nd. Capital, £1,500. Objects: To carry on the business of electrical engineers and general electrical installation contractors. &c. Directors: W. J. Freshwater (managing director), 38, Cromwell Road, Rugby; and two others.

Charleson Accumulator Co., Ltd.—Private company. Registered March 22nd. Capital, £1,200. Objects: To carry on business as manufacturers and repairers of and wholesale and retail dealers in accumulators and batteries, &c. Permanent directors: M. Dawson and V. Charleson, both of 136, St. Georges Road, Bolton. Registered office: 136, St. Georges Road, Bolton.

Essangee (Electrical), Ltd.—Private company. Registered March 18th. Capital, £500. Objects: To acquire the business of an electrical engineer carried on by P. C. Stephens in his own name and under the style of P. Campbell Stephens & Co., at 20, Sackville Street, Manchester. Directors: P. C. Stephens, 2, The Crescent, Fallowfield, Manchester; and J. H. Goodwin, 33, Demesne Road, Manchester, 16. Registered office: 86, Oxford Street, Manchester.

Merco Trading Co., Ltd.—Private company. Registered March 25th in Edinburgh. Capital, £100. Objects: To carry on the business of radio, electrical, and musical instrument factors, &c. The directors are: J. Merrens, 164, Camphill Avenue, Glasgow, S.2, and D. M. McNaught, 234, St. Vincent Street, Glasgow, C.2. Registered office: 20, King Street, Glasgow.

I. Cranmer & Co. (Electrical), Ltd.—Private company. Registered March 30. Capital, £500. Objects: To acquire the business of J. A. R. Cranmer carried on at 143, Cannon Street, E.C.4, and to carry on business as manufacturers of and dealers in electric accumulators, batteries, acids and containers, dynamos, armatures, &c. The subscribers are: D. A. Philips, 42, Hollycroft Avenue, N.W.3, and G. W. R. Rees, 6, New Square, W.C.2. Registered office: 143, Cannon Street, E.C.4.

Great Eastern Electric Co., Ltd.—Private company. Registered March 30th. Capital, £2,000. Objects: To carry on the business of manufacturers of and dealers in radio and television sets, transmitters, receivers, parts and accessories, electric and other clocks, &c. The permanent directors are: J. Braham and A. L. Braham, both of 6, Grove Lane, Stamford Hill, N.16. Registered office: 73, Houndsditch, E.C.3.

A. E. Wilson (Electrical Contractors), Ltd.—Private company. Registered March 30th. Capital, £500. Objects: To acquire the business of an electrical engineer and contractor carried on by A. E. Wilson at 1333, High Road, Whetstone. The permanent directors are: A. E. Wilson, 13, Essex Park, Finchley, N.3, and G. Wilson, 76, Oakroyd Avenue, Potters Bar. Registered office: 1333, High Road, Whetstone, N.20.

Returns of Electrical Companies

Statements of Capital

New Armature Co., Ltd.—Capital, £1,000 in £1 shares. Return dated December 31st, 1938. 745 shares taken up. £745 paid. Mortgages and charges, nil.

Scott Insulated Wire Co., Ltd.—Capital, £14,000 in 4,000 preference and 10,000 ordinary shares of £1. Return dated December 31st, 1938. 2,075 preference and 10,000 ordinary shares taken up. £12,075 paid. Mortgages and charges, £5,690.

South Beds Electrical Finance, Ltd.—Capital, £30,000 in 10,000 ordinary and 20,000 5½ per cent. redeemable preference shares of £1. Return dated May 18th, 1938 (filed February 18th, 1939). 3,300 ordinary and 11,500 preference shares taken up. £14,800 paid. Mortgages and charges, nil.

Atmos Electrical Co., Ltd.—Capital, £2,000 in 1,000 preference and 1,000 ordinary shares of £1. Return dated May 25th, 1938 (filed March 6th, 1939). 750 shares taken up. £750 paid. Mortgages and charges, nil.

H.E.C. Electric Co., Ltd.—Capital, £1,000 in 400 preference and 600 ordinary shares of £1. Return dated October 15th (filed December 9th), 1938. £173 paid on 170 preference and 3 ordinary shares. £200 considered as paid on 200 ordinary shares. Mortgages and charges, nil.

Chesham & District Electrical Installation Co., Ltd.—Capital, £200 in £1 shares. Return dated November 26th, 1938 (filed March 10th, 1939). All shares taken up. £200 paid. Mortgages and charges, nil.

Cark and District Electricity Co., Ltd.—Capital, £5,000 in £1 shares. Return dated December 31st, 1938. 4,000 shares taken up. £2,000 paid. £2,000 considered as paid. Mortgages and charges, £3,000.

Power Light & Heat, Ltd.—Capital, £6,800 in 1,500 preference and 5,300 ordinary shares of £1 each. Return dated December 21st, 1938. 1,500 preference and 5,285 ordinary shares taken up (including 30 forfeited shares). £1,502 paid, £30 calls unpaid. £5,253 considered as paid. Mortgages and charges: £700.

Hornby Electrical Supplies Co., Ltd.—Capital, £20,000 in 15,000 preference and 100,000 deferred shares of 1s. each. Return dated December 21st, 1938. 1,100 preference and 26,000 deferred shares taken up. £2,400 paid. Mortgages and charges nil.

British Italian Power & Irrigation Trust, Ltd.—Capital, £75,000 in 70,000 ordinary shares of £1 each and 100,000 deferred shares of 1s. each. Return dated December 26th, 1938. 14,957 ordinary and 100,000 deferred shares taken up. £19,957 paid. Mortgages and charges nil.

General Cable Manufacturing Co., Ltd.—Capital, £150,000 in 150,000 preference shares of 10s. each and 300,000 ordinary shares of 5s. each. Return dated December 28th, 1938. All shares taken up. £85,000 paid on 150,000 preference and 40,000 ordinary. £65,000 considered as paid on 260,000 ordinary. Mortgages and charges nil.

Townlea Electrical Co., Ltd.—Capital, £1,000 in 300 preference and 700 ordinary shares of £1. Return dated December 30th, 1938. 500 ordinary shares taken up. £500 considered as paid. Mortgages and charges nil.

International General Electric Co. of New York.—Capital, £100,000 in £1 shares. Return dated December 31st, 1938 (filed February 16th, 1939). 25,100 shares taken up. £25,100 paid. Mortgages and charges nil.

Electrical Manufacturing & Plating Co., Ltd.—Capital, £300 in 300 shares of £1 each. Return dated December 31st, 1938. All shares taken up. £300 considered as paid. Mortgages and charges nil.

Inventum Electrical Appliances, Ltd.—Capital, £500 in £1 shares. Return dated January 5th, 1939. 52 shares taken up. £52 paid. Mortgages and charges nil.

Swedish General Electric, Ltd.—Capital, £100 in £1 shares. Return dated January 6th, 1939. Two shares taken up. £2 paid. Mortgages and charges nil.

Fuller Electrical and Manufacturing Co., Ltd.—Capital, £100 in £1 shares. Return dated January 6th, 1939. Two shares taken up. £2 paid. Mortgages and charges nil.

Mortgages and Charges

Underwood (Electric), Ltd.—Mortgage on leasehold land and premises in Hurst Street, Birmingham, with plant and machinery, dated March 15th, 1939, to secure all moneys due or to become due from the company to Martins Bank, Ltd.

Scophony, Ltd.—Mortgage and charge on the company's undertaking and property, present and future, including uncalled capital, dated March 6th, 1939, to secure all moneys due or to become due from the company to National Provincial Bank, Ltd.

Receiver Released

Latham Productions, Ltd. (formerly Whitworth Electrical Repairs, Ltd.).—D. R. Macdonald, of Abbey House, Baker Street, N.W.1, ceased to act as receiver and/or manager on March 7th, 1939.

Increases of Capital

Llanelly and District Electric Supply Co., Ltd.—The nominal capital has been increased by the addition of £200,000 in £1 unclassified shares, beyond the registered capital of £1,200,000.

Underwood (Electric), Ltd.—The nominal capital has been increased by the addition of £17,898, in £1 ordinary shares, beyond the registered capital of £6,102.

Goodliffe Electric Co., Ltd.—The nominal capital has been increased by the addition of £600, beyond the registered capital of £2,000. The additional capital is divided into 500 8 per cent. cumulative irredeemable preference shares of £1 and 1,000 ordinary shares of 2s.

County Electrical Services, Ltd.—The nominal capital has been increased by the addition of £29,900, in £1 ordinary shares, beyond the registered capital of £100.

Reports and Dividends

Associated Electrical Industries, Ltd., held its annual meeting on March 30th, when Sir Felix Pole (chairman), who presided, said that the inflow of orders during 1938 was greater than in any previous year except 1937. This was in accordance with expectations, having regard to the abnormally large quantity of orders received in 1937. All the works of the group were fully employed, and the output was the highest in the history of the company. Special efforts were made to effect deliveries, and the unexecuted orders on hand at the end of the year were slightly less than at December 31st, 1937.

They had placed their manufacturing, engineering and research facilities at the disposal of the Government. A considerable amount of Government work was in process of manufacture and the factory at Trafford Park had been extended to cope with Air Ministry and War Office contracts. A factory for the manufacture of aircraft by the Metropolitan-Vickers Electrical Co., Ltd., in technical collaboration with A. V. Roe & Co., Ltd., was nearing completion on land adjoining the Trafford Park works. Also, in co-operation with John Brown & Co., Ltd., a financial interest had been acquired in the Westland Aircraft Co., Ltd., of Yeovil. The British Thomson-Houston Co., Ltd., would be particularly associated with this development. Their activities in connection with national defence had been arranged so as to interfere as little as possible with their normal production of electrical and allied products, consistent with giving preferential treatment to the national defence work.

They were especially anxious not to reduce in any degree their export business. They had continued their policy of keeping personal contact with overseas markets, and had received some valuable orders, notwithstanding the difficulties of competing with certain countries. Their companies were represented and were active in overseas markets, and were determined to secure, in the national interest no less than in their own, a fair share of the available business, even though the ruling price levels were often unsatisfactory. While orders received during 1938 were not quite up to the high level of the previous year, the value of shipments made last year exceeded even the satisfactory dimensions of those of 1937. The difficult conditions governing supplies of materials that were commented upon at last year's meeting had been somewhat mitigated, enabling a reduction to be effected in the volume of stocks and work in progress, a downward movement that would probably continue.

The use of electricity in this country continued to increase, and this growth demanded the manufacture of more generating and other equipment, for which they received a large volume of orders. He did not propose to read a long list, but the largest machine ordered was a 60,000-kW turbo-generator set, and a number of other orders were received for large turbo-generator sets, switchgear, impulse type circuit-breakers, transformers for the power stations supplying electricity to the grid, and equipment for collieries, steelworks and other industrial undertakings, and Metadyne equipments for the London Passenger Transport Board. He might particularise one export order which was secured notwithstanding extreme competition. It was for Enso-Vallinkoski, Finland, and comprised four 30,000-kVA water wheel alternators. These machines were estimated to weigh over 400 tons each, and would be the largest yet built in this country.

With regard to smaller items, their sales of meters, radiant plates for domestic heating, electrodes, electric vehicles, X-ray tubes, and their "Cosmos" lamps increased satisfactorily. They continued to spend large sums each year on engineering development and research work.

Their education department was an outstanding feature of their activities and last year in association with the Lancashire Education Authority they provided a new school in the Trafford Park works. The school had been built by the company and would be staffed by the Lancashire Education Authority. It would be opened in the course of a few weeks. About 1,300 employees attended day and evening classes in vocational and other subjects. The Long Service Association, inaugurated in 1923, continued to grow, and now had a membership of 1,271.

The Automatic Telephone & Electric Co., Ltd., held its annual meeting on March 30th. Sir Alexander Roger (chairman), who presided, said that the orders received and factory output during the year under review were the most satisfactory in their history. The drastic reorganisation of their wholly owned subsidiary, Elexcel, Ltd., had enabled a profit to be earned instead of an annual deficit. Subsidiary overseas selling companies had made satisfactory profits. They had again been able to reduce their prices as a result of improved production efficiency and increased volume of output. The price of completed main exchange equipment was only 60 per cent. of its equivalent price of ten years ago, notwithstanding rises in costs of labour and material, while for a number of years miscellaneous telephone equipment had been supplied at figures yielding little or no profit to the manufacturer.

In 1938 they exported to sixty-two different countries. The position of the exporter from this country in the main was that he no longer traded against individual competitors; he was the individual competitor trading against the group competition of industries owned and controlled in all but name by governments. They had a large volume of work in hand for the Post Office, and deliveries were being well maintained. Their business with the Union of South Africa and Poland continued to be associated with excellent relationships, and this equally applied to the transactions with other administrations such as Australia, India and New Zealand.

The Portuguese Government, in deciding to mechanise the State telephone system, had awarded the company a supply agreement for the provision of all its automatic telephone equipment requirements for the next fifteen years. They had continued their policy of patent and technical interchange arrangements and had extended their sphere, and had opened up several fresh avenues by which they obtained access to useful development and design information.

Ericsson Telephones, Ltd.—Presiding at the annual meeting on March 29th, Mr. T. Kirkham (managing director) said that notwithstanding the disturbed conditions which prevailed throughout the past year, they emerged in a stronger position than ever. The order book was again a record one and the careful planning of preceding years enabled them to achieve a much greater output. During the past few years their output had trebled and they now had upwards of 4,500 employees, all working full time. Their sales abroad had shown a substantial increase, and every effort was being made to expand them further. Each year since 1933 he had been able to report an ever-growing volume of trade, and he saw no reason why this should not continue. Last year he informed shareholders that they had acquired the rights to new processes for the manufacture of metallic powders and a highly dispersed red lead. Unexpected difficulties were experienced in obtaining certain materials for the special plant required, otherwise they would have been in full production some time ago. These difficulties had now been overcome and production was about to commence. Their other established departments had all done well during the year and they had contributed substantially to the successful results. With regard to the future, they again had a record volume of orders in hand and splendid prospects of further large contracts. Their factory plant was thoroughly modern and was eminently suitable for other work of national importance should necessity arise.

Baird Television, Ltd., held its adjourned ordinary general meeting on March 31st, at which Sir Harry Greer (chairman), who presided, said that television had not been profitable to anyone so far. The development of the market was not entirely within the control of companies such as theirs and, in particular, the marketing of home receiver sets had been slower than was anticipated. However, he felt that two of their possibilities, viz., home receivers and large screens, had now reached the stage at which commercial success could be anticipated. At the end of last year a campaign was organised by the Radio Manufacturers' Association, the B.B.C., and the Post Office, in which they participated, with the object of popularising the television service for home entertainment. This campaign met with considerable success, so much so that the demand at the moment for sets was greater than the supply. They had therefore every reason to hope for the long-anticipated profitable commercial exploitation of home receivers during the coming year. When transmissions first took place from the Alexandra Palace they had no organisation for manufacture or sale of receiving sets, and they availed themselves of an arrangement with Bush Radio, Ltd., by which they undertook to make and market their sets. They felt now that the time had come to handle the whole of their manufacture and marketing on their own, and from June this year they would do this entirely through their own organisation. They had under negotiation a contract for the manufacture and installation of cinema equipment in a large number of cinemas which would keep them busy for the next eighteen months. At the conclusion of the meeting other meetings were held at which approval was given to the financial proposals, particulars of which were given in our issue of March 17th.

Heatrae, Ltd., reports a net profit for the year ended February 28th of £16,634, to which is added £3,016 brought in, making £19,650. The ordinary dividend for the year is 12½ per

cent., and £5,000 is applied to writing down goodwill account to £7,000. The balance carried forward is £5,835. Meeting: April 13th at Norwich.

The Jarrow & District Electric Traction Co., Ltd., reports a net profit for 1938 of £31, increasing the credit balance carried forward to £114.

The Shropshire, Worcestershire & Staffordshire Electric Power Co. is paying a final dividend of 4 per cent., less tax on the "A" ordinary shares, making 8 per cent. for the year (same), and 3 per cent., less tax, on the "B" ordinary shares, making 5½ per cent. for the year (same).

Sterling Electric Holdings, Ltd., has announced that the payment of the cumulative preference dividend for the six months ended March 31st will be deferred until the accounts for the year are prepared.

The Windermere & District Electricity Supply Co., Ltd., reports a net profit for 1938 of £12,454 which, with £5,396 brought in and other revenue, makes a total of £19,674 available. Reserve receives £4,500 and the final ordinary dividend is 6 per cent., making 10 per cent. for the year. The balance carried forward is £5,203.

Aktiebolaget Elektrolux reports a net profit for 1938 of Kr. 8,901,465, a decrease of Kr. 250,700 as compared with 1937. The final dividend is Kr. 5, maintaining the distribution for the year at Kr. 10. The balance carried forward is increased by Kr. 2,901,466 to Kr. 16,150,020.

The British Oxygen Co. reports profits for 1938, after providing for depreciation, of £770,236, an increase of £31,961, and a net balance of £508,059 (against £455,481). The final ordinary dividend is 10 per cent., again making 17 per cent. for the year, general reserve receives £62,160, and £50,000 is reserved against buildings, plant and cylinders. The balance carried forward is £48,007 (against £44,385 brought in).

The Rangoon Electric Tramway & Supply Co. reports a gross profit for 1938 of £194,924, as compared with £203,988 in the preceding year, to which is added £18,311 brought in, making £213,235. After transferring £151,974 to reserves, &c., it is proposed to pay a final ordinary dividend of one rupee per share, making Rs.1.6 for the year and to carry forward £20,297.

The Tewkesbury Electric Light Co. reports a profit for 1938 of £1,412, and an available balance of £1,646. The ordinary dividend for the year is 8 per cent. (against 5 per cent.), and £606 is carried forward. The undertaking of the company has been sold to the Shropshire, Worcestershire and Staffordshire Electric Power Co., as from July 1st, 1938, by an arrangement confirmed by shareholders on November 18th.

The British Thermostat Co., Ltd., has announced a final dividend of 11⅛ per cent., less tax, making 18½ per cent. for the year (same).

The Marconi International Marine Communication Co., Ltd., reports a gross revenue for 1938 of £480,287, as compared with £452,297 in the preceding year, and a net profit of £139,790 (against £114,844). N.D.C. receives £5,000 and reserves £15,537. As we have already announced, the distribution for the year is increased to 10 per cent. by a cash bonus of 2½ per cent. The balance carried forward is £11,679 (against £11,698 brought in).

The South Wales Electric Power Co. has announced a final ordinary dividend of 3½ per cent., making 5½ per cent., less tax, for the year (against one payment of 5 per cent.).

The Hydro-Electric Securities Corporation reports a net profit for 1938 of $637,706, as compared with $728,049 for 1937. The dividend for the year on the common shares is again 20 cents a share, leaving a balance of $5,647, which increases the surplus account as at December 31st to $2,462,855.

Stocks and Shares

MONDAY EVENING.

STOCK Exchange markets remain at the mercy of foreign political events. One dictator makes a speech to-day which upsets the markets. To-morrow, another with a more pacific oration, gives the markets a chance to recover. What will happen on the third day, nobody can tell.

With matters in this state of perpetual suspense it is no more than natural to find business extremely tenuous and prices very jumpy. The nervousness is expressed principally in wide fluctuations amongst American stocks and shares, for, oddly enough, New York seems to be more influenced from day to day by Continental politics than are our own markets on this side.

It will be observed by reference to our price lists that the movements on the whole are trifling, but that the majority of the changes are downward. The coming of the Easter holiday makes a welcome break in a period which to investor and Stock Exchange markets alike is certainly a trying one.

Gilt-Edged Stocks

The week's events have put something of a strain on the stoical attitude with which the gilt-edged market has confronted, up to now, an uninviting prospect. Prices have moved erratically. War Loan, for instance, which was over 98 in the middle of March, has been under 95 in the past few days, and is now 95¾. The price is within striking distance of the minimum quotation of 93 fixed during the Munich crisis. The prospect of a prolonged spell of large-scale Government borrowing is accompanied by renewal of doubt on the question of taxation. From the Chancellor's first statement on defence borrowing the market had assumed a clear intention on the part of the Government to avoid anything serious in the way of new taxes. The impression went uncontradicted until last week, when it was suggested that people had, perhaps, taken too much for granted in this connection. This has divested Budget anticipations of one of their few agreeable elements.

Electrical Profits in 1938

By general consent, 1938 was a much more difficult year than 1937 from the point of view of trade. Few scars are to be seen, however, among the annual accounts published to date by the electrical equipment and manufacturing companies. Shareholders may look ruefully at the year's paper losses on their capital; but there is little that they can quarrel with in the maintenance of their income, or in the excellent figures which are now making their appearance every week. Some of the many reports which appeared in March are set out in the table below, which gives an idea of the uniformly good experience, in the circumstances, of a number of sections of the industry.

Changes of the Year

These ten companies have published their accounts within the past four or five weeks:—

Company	Net Profits 1938	Change on 1937
	£	£
British Insulated Cable	597,066	− 26,547
Lancashire Dynamo	133,709	+ 12,189
Assoc. Elec. Industries	664,308	− 27,185
British Thomson-Houston	354,056	+ 48,078
Switchgear & Cowans...	28,715	− 6,762
Telegraph Construction	62,923	+ 194
Ericsson Telephones	161,293	+ 12,589
Automatic Tel. & Elec.	202,074	+ 53,450
Allen West	101,049	+ 37,313
Reyrolle	187,476	+ 32,154

Dividends paid by these companies were all at the same rates as before, except that Automatic Telephone and Electric raised the distribution from 10 to 12½ per cent., and Allen West from 7½ to 10 per cent.

American Anxieties

Wall Street has taken the political developments more hardly than London markets. According to various indices of industrial stocks and shares, American prices have fallen by nearly 10 per cent., and British prices by less than 9 per cent. since the early part of last month. The lack of logic in the situation is explained by the idea that political unease has sharpened the feeling of uncertainty which prevails in respect of U.S.A. business conditions. Those industrial pointers which are accepted as indicative of American industrial activity, are by no means satisfactory to the bull party. Owing partly to this, and partly to the European position, some of the leading American shares have fallen fairly steeply in the last few business days. American "Tel. & Tel." are down 3 points. Western Unions have fallen 1. Anglo-American Telegraph stocks are lower in sympathy. Thanks to the increased dividend, Marconi Marines advanced $\frac{1}{16}$ to 28s. 9d.

Price Movements

Callender's Cable shares at 3⅞, are quoted half-a-crown lower on the week; Enfield Cables at 51s. 3d. and Crompton Parkinsons at 17s. 6d. have each lost 1s. 3d. British Thermostats are down to the same extent; the company is paying a dividend of 18½ per cent. for the second consecutive year. Otherwise the list of electrical equipment shares shows few changes worthy of note, except for a rise in Hopkinsons from 42s. 6d. to 43s. 9d. The market in electricity supply shares maintains its customary calm; North Metropolitans at 43s. 9d. and West Gloucestershires at 18s. 6d. are down 1s. 3d. and 1s. 6d. respectively. In the overseas group, Victoria Falls are $\frac{1}{16}$ off, at 66s. 3d. Among communication stocks, the Cable and Wireless issues have recovered an initial reverse, but Great Northerns have continued downhill to 30½, against 34½ a fortnight ago.

Broadcast Relays

A year ago the chairman of Broadcast Relay Services described the business as being in a state of suspended animation Last week's decision by the Postmaster-General puts an end to the suspense for at least ten years. The company's 5s. ordinary shares, now 9s. 9d., duly earned the distinction of a substantial "plus" on the week. The previous situation arose out of the Ullswater Report, in 1936, recommending the transfer of the broadcast relay exchanges to the Post Office. The company's licence, already extended, ran only until the end of this year, when the Post Office had the power to buy up the plant and equipment at their then value. This licence will now be extended to 1949, the Government having come to the conclusion that there is scope for a service by the relay companies side by side with a Post Office service over telephone lines used in connection with a wireless set. Broadcast Relay Services have had a successful experience since their formation. The last dividend was 10 per cent. for 1937-8, and the next report is due in May. It has been suggested that the Post Office decision may be little to the liking of the radio manufacturers. Nevertheless, the price of Electric and Musical Industries shares at 11s. 6d. has not been affected, while Pye deferred at 10s. 6d. are only a few pence lower. At last week's Baird Television meeting, when the new finance arrangements were approved, the chairman's optimism relied a good deal upon the possibilities of television in connection with the cinema. The company's deferred shares stand at 1s., and the preferred at 9d.

ELECTRICAL COMPANIES' SHARES

Prices, dividends and yields

Company	1938 High-est	1938 Low-est	Dividend Pre-vious	Dividend Last *	Price April 3	Rise or Fall	Yield £ s. d.
Home Electricity Companies							
Bournemouth and Poole	68/3	62/–	15	15	65/9	—	4 11 2
British Power & Light	30/9	24/6	7	7	29/6	—	4 15 0
City of London	34/6	28/6	7½	7½	32/–	–6d.	4 2 6
Clyde Valley	42/6	33/–	8	8	35/9	—	4 11 4
County of London	51/9	38/9	10½	10½	43/–	—	4 17 8
Edmundson's:							
7% Pref.	33/3	30/–	7	7	30/6	—	4 11 10
Ord.	40/9	18/9	9	9	24/6	–6d.	—
Elec. Dis. Yorkshire	43/6	37/9	9	9	40/–	—	4 10 0
Elec. Fin. and Securities	51/9	49/–	12½	12½	47/6	—	5 5 3
Elec. Supply Corporation	55/–	50/–	12	12	51/3	—	4 13 7
Isle of Thanet	21/3	18/6	4	4	18/6	—	4 6 6
Lancs Light and Power	35/–	26/–	7½	7½	32/6	—	4 12 4
Llanelly Elec.	23/6	21/–	5½	5½	21/6	—	5 2 4
Lond. Assoc. Electric	32/9	28/–	7	7	28/–	–9d.	5 0 0
London Electric	36/3	32/–	7	7	33/–	—	4 4 10
London Power Deb. Red.	108½	100	5	5	103½	—	4 16 6
Metropolitan	51/–	41/–	12	12	48/3	—	4 19 6
Midland Counties	39/9	33/–	8	8	37/–	—	4 6 6
Mid. Elec. Power	41/9	37/–	8	9	38/9	—	4 13 0
Newcastle Elec.	31/9	27/6	7	7	28/9	—	4 17 4
North Eastern Electric:							
Ordinary	34/–	25/–	7	7	29/6	–6d.	4 15 0
7% Pref.	34/–	30/–	7	7	31/–	—	4 10 4
Northampton	47/6	43/9	10	10	47/6	—	4 4 2
Notting Hill 6% Pref. (£10)	14½	13½	6	6	13½	—	4 15 9
North Met. Elec.:							
Ordinary	49/–	43/–	10	10	43/9	–1/6	4 11 4
6% Pref.	30/6	28/3	6	6	28/–	—	4 5 9
Richmond Elec.	30/6	28/–	7	7	28/9	—	4 17 5
Scottish Power	38/9	32/–	8	8	35/–	—	4 11 6
Southern Areas	22/9	18/6	4½	5	21/6	—	4 13 0
South London	32/6	31/–	7	7	29/–	–6d.	4 16 7
West Devon	23/3	21/3	5	5	1½	—	4 9 0
West Glos.	19/–	16/9	2	2	18/6	–1/6	2 3 3
Yorkshire Elec.	42/–	36/9	8	8	36/6	—	4 7 6
Overseas Electricity Companies							
Atlas Elec.	4/6	2/6	Nil	Nil	3/–	—	—
Calcutta Elec.	44/3	36/3	12*	10*	37/6	—	5 6 7
Cawnpore Elec.	40/–	35/–	10	10	31/3	—	6 7 10
East African Power	28/3	22/6	7	7	25/–	—	5 14 0
Jerusalem Elec.	26/9	23/3	5	6	24/–	—	5 0 0
Kalgoorlie (10/–)	12/–	9/6	7½	7	10/3	—	7 6 4
Madras	34/6	28/9	8*	8	30/–	—	5 6 8
Montreal Power	31¾	26¾	1¼	1¼	32¾	+½	—
Palestine Elec. "A"	31/9	27/–	7½*	7½*	26/3	—	5 14 3
Perak Hydro-electric	25/3	17/–	7	6	17/6	—	6 17 2
Shawinigan Power	23¼	16¼	85cts.	83cts.	21½	—	—
Tokyo Elec. 6%	65½	39	6	6	52½	–2	11 8 6
Victoria Falls Power	76/3	55/–	12	13½	66/3	–1/6	4 1 7
Whitehall Investments Pref.	22/3	15/–	7½	7½	17/6	—	8 11 6
Public Boards							
Central Electricity:							
1950–70	115¾	97	5	5	108½	—	4 12 2
1955–75	118½	100	5	5	110½	—	4 10 6
1951–73	111	95	4½	4½	105	–½	4 5 9
1963–93	101	85	3½	3½	92½	—	3 14 10
London Elec. Trans. Gtd.	93½	88	2½	2½	87	—	2 17 1
London & Home Counties, 1955–75	112¾	97½	4½	4½	107	—	4 4 1
Lond. Passenger Transport:							
A	119½	104¾	4½	4½	110	—	4 1 10
B	122¾	105	5	5	110	—	4 11 0
C	84	68	4½	4	70½	–1	5 13 6
West Midlands Joint Elec., 1948–68	115½	102½	5	5	109½	—	4 11 3
Telegraph and Telephone							
American Tel. & Tel.	160	114	9	9	167½	–3	5 7 5
Anglo-Am. Tel.:							
Pref.	115½	100½	6	6	95½xd.	–2	6 5 8
Def.	28	23	1½	1½	20	–1	7 10 0
Anglo-Portuguese	23/6	19/3	8	8	22/6	—	7 2 1
Cable & Wireless:							
5½% Pref.	104	76½	4½	5½	81½	—	6 15 0
Ord.	67¾	34	—	4	41½	—	9 12 10
Income	102½	99	—	—	99	—	4 1 0
Canadian Marconi $1	6/6	3/9	—	Nil	4/–	—	—
Globe Tel. & Tel.:							
Ord.	32/6	26/3	5½*	7½*	25/–	—	6 0 0
Pref.	27/6	23/9	6	6	25/–	—	4 16 0
Great Northern Tel. (£10)	42½	34	20	20	30½	–1	6 11 2
Inter. Tel. & Tel.	12½	5½	Nil	Nil	8½	—	—
Marconi-Marine	30/6	21/6	7½	10	28/9	+1/6	6 18 2
Oriental Telephone Ord.	59/3	2½	12*	12*	2½	—	4 16 0
Radio Corpn.	9½	4¾	8	6	7½	—	—
Telephone Props.	13/9	11/3	5	6	13/9	—	8 14 6
Telephone Rentals (5/–)	10/–	7/6	5	6	9/–	—	3 6 8
Western Union	34½	17	2¾	—	21½	–1	—
Traction and Transport							
Anglo-Arg. Trams:							
First Pref.	11/–	2/6	Nil	Nil	7/6	+1/6	—
4% Inc.	31	8	Nil	Nil	12	—	—
British Electric Traction:							
Def. Ord.	1060	675	5	6	850	—	—
Pref. Ord.	175	150	8	8	160	—	5 0 0
Bristol Trams	45/–	34/3	8	10	43/9	—	4 11 2
Brazil Traction	14½	7½	$1	—	11½	+⅜	—
Calcutta Trams	26/9	21/6	8	8	24/–	—	6 13 4
Cape Elec. Trams.	18/6	15/6	5	6	17/6	—	6 17 2
Lancs Transport	35/3	29/3	10	10	35/–	—	5 14 3
Mexican Light:							
1st Bonds	39	16½	5	5	25	—	—
Rio 5% Bonds	91	47	5	5	75	—	6 13 4
Southern Rly:							
5% Prefd.	87	48	5	5	62½	—	8 0 0
5% Pref.	116	83	5	5	90½	—	5 10 6
T. Tilling	60/–	36/6	10	10	2½	—	4 14 1
Tilling & B.A.	57/–	46/–	10	9*	52/6	—	3 8 7
West Riding	46/3	30/6	10	10	33/3	–6d.	—
Equipment and Manufacturing							
Aron Electricity Ord.	40/3	31/–	15	15	31/3	—	9 12 0
Assoc. Elec.:							
Ord.	45/3	32/–	10	10	40/–	—	5 0 0
Pref.	38/9	35/6	8	8	35/6	—	4 10 0
Automatic Telephone & El.	43/–	35/–	10	12½	42/6	—	5 17 9
Babcock & Wilcox	44/–	32/6	10	10	40/–	—	5 0 0
British Aluminium Ord.	54/–	40/–	10	12½	54/3	+6d.	4 12 3
British Insulated Ord.	95/9	77/–	20	20	4¼	—	4 18 6
British Thermostat (5/–)	16/–	9/–	18½	18½	12/6	–1/6	7 8 0
British Vacuum Cleaner (5/–)	35/9	27/–	40	40	20/–	—	—
Brush Ord.	5/6	4/9	Nil	Nil	5/–	—	—
Callender's	5⅛	78/6	20	20	81/3	—	4 18 9
Chloride Elec. Storage	77/9	61/–	15	20	3⅞	–⅛	5 3 1
Consolidated Signal	116/–	75/–	36½	36½	85/–	—	8 11 9
Crabtree (10/–)	29/–	22/–	17½	17½	23/9	—	7 7 4
Crompton Parkinson:							
Ord. (5/–)	32/3	18/9	12½	15	17/6	–1/6	—
E. K. Cole (5/–)	8/9	4/6	5	10	6/6	—	7 13 10
Elec. & Musical Industries (10/–)	16/3	9/–	10	5	11/6	—	4 7 0
Electric Construction	36/–	31/–	10	12½	35/–	—	7 2 10
Enfield Cable Ord.	5⅝	46/–	25	16½	51/3	–1/6	6 5 6
Electrical Switchgear (10/–)	27/–	22/6	16	16	25/9	–1/–	6 4 3
English Electric	33/–	24/6	10	10	32/6	+6d.	6 3 1
Ensign Lamps (5/–)	14/3	11/3	—	25	14/–	—	8 18 6
Ericsson Tel. (5/–)	2⅛	31/-	25*	25*	38/9	—	3 4 6
Ever Ready (5/–)	26/3	16/6	45	35	22/–	–6d.	7 19 1
Falk Stadelmann	34/3	27/–	10	10	25/–	—	8 0 0
Ferranti Pref.	27/6	25/–	7	7	24/–	—	5 16 8
G.E.C.:							
Pref.	34/–	31/3	6½	6½	30/–	—	4 6 8
Ord.	79/3	67/–	17½	20	77/–	—	5 4 0
Greenwood & Batley	27/6	19/–	7	15	26/3	—	11 8 2
Hall Telephone (10/–)	24/6	18/3	15	15	20/–	—	7 10 0
Henley's (5/–)	21/–	16/–	15	20	19/6	–3d.	5 2 7
4½% Pref.	23/–	22/–	4½	4½	22/6	—	4 0 0
Hopkinsons	40/–	32/6	10	12	43/9	+1/6	5 9 7
India-Rubber Pref.	21/9	20/3	5½	5½	21/3	—	5 3 6
Intl. Combustion	5/8	4½	32½	32½	5⅛	—	7 3 6
Ismay Industries (5/–)	6/9	1/–	6	6	9d.	—	—
J. Lucas	57/9	47/6	15	15	57/6	—	5 4 1
Johnson & Phillips	43/9	32/6	10	12½	37/6	—	6 13 6
Lancashire Dynamo	72/3	53/–	25	25	65/–	—	7 14 0
Laurence Scott (5/–)	12/–	9/–	7	15	11/3	—	6 13 4
London Elec. Wire	35/–	28/3	12	7½	30/–	—	5 0 0
Mather & Platt	49/–	41/3	13½	13½	47/6	–9d.	5 13 8
Metropolitan Elec. Cable Pf.	22/–	21/–	5½	5½	21/3	—	5 3 6
Murex	93/9	66/3	20	20	75/–	—	5 6 8
Pye Deferred (5/–)	12/–	8/–	5	25	10/–	–6d.	12 10 0
Revo (10/–)	36/3	30/–	12	17½	33/9	—	5 3 8
Reyrolle	62/6	49/–	12½	12½	57/6	+3d.	4 7 0
Siemens Ord.	31/–	20/6	7½	7½	23/3	—	6 10 4
Strand Elec. (5/–)	6/–	4/–	5	10	5/0	—	10 0 0
S. Smith (1/–)	9/9	6/3	37½	50	8/9	—	5 14 3
Switchgear & Cowan (5/–)	19/6	12/6	20	20	13/9	—	7 5 6
Telegraph Condenser (10/–)	18/9	12/–	5	5	7/6	—	6 13 4
Telegraph Construction	2½	36/–	10	10	37/6	—	5 6 8
Telephone Mfg. (5/–)	9/9	7/–	9	9	9/–	—	5 0 0
Tube Investments	89/6	70/–	23¾	23¾	87/6	—	5 10 0
Vactric (5/–)	9/9	4/6	10	4	3/9	—	5 6 8
Vickers (10/–)	27/–	17/6	10	10	21/6	+6d.	4 13 0
Westinghouse Brake	63/9	45/–	17½	17½	50/–	—	7 0 0
Walsall Conduits (4/–)	26/–	22/6	—	55	27/6	—	7 17 0
West, Allen (5/–)	6/6	4/6	7½	10	6/9	—	7 8 2

* Dividends are paid free of Income Tax.

NEW PATENTS

Electrical Specifications Recently Published

Compiled by a firm of chartered patent agents. The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1937

3703. "Automatic control of electrically driven winding reels." British Thomson-Houston Co., Ltd. (Allgemeine Elektricitäts-Ges.). August 8th, 1938. (Convention date not granted.) (501839.)

15728. "Television systems." A. D. Blumlein and R. E. Spencer. June 7th, 1937. (501966.)

15757. "Electric wave signal transmitting apparatus." J. C. Stewart. June 6th, 1936. (Cognate applications 15758/37 and 15759/37.) (502013.)

17791. "Electric protective apparatus." A. Cianchi. June 25th, 1937. (501842.)

17819. "Directional aerial systems." E. C. Cork and J. L. Pawsey. June 26th, 1937. (501843.)

18436. "Telephone exchange systems." R. J. Berry (C. Lorenz Akt. Ges.). July 2nd, 1937. (501915.)

18863. "Inductive heating with low frequency." A. E. Fekete and P. Halaz. July 7th, 1937. (502082.)

18880. "Rontgenography." W. W. Groves (I. G. Farbendustrie Akt. Ges.). July 7th, 1937. (502014.)

21517. "Control devices comprising a galvanometer." J. F. Augier-Queyras. August 5th, 1936. (Cognate applications 21518/37 and 21519/37.) (501917.)

21550. "Amplifier arrangements such as are used in wireless installations, sound recording or reproducing apparatus, and so on." Etablissements B. Roux. August 4th, 1936. (501918.)

21630. "Speed-control of power systems." General Electric Co., Ltd., H. J. Coates and W. Wilson. August 5th, 1937. (501969.)

21811. "Luminous electric-discharge tubes." Scophony, Ltd., and H. P. Barasch. August 7th, 1937. (501920.)

22006. "Railway signalling systems." Standard Telephones & Cables, Ltd., and J. B. Griffiths. August 10th, 1937. (502085.)

22009. "Apparatus for generating voltages of harmonic frequencies from an alternating-current supply." Standard Telephones & Cables, Ltd. October 17th, 1936. (502086.)

24230. "Electrical remote-control systems." Marconi's Wireless Telegraph Co., Ltd., H. J. H. Wassell and F. H. Cannon. September 4th, 1937. (502089.)

24308. "Electrical testing apparatus." B. M. Hadfield. September 6th, 1937. (502143.)

24401. "Apparatus for the common operation of heat radiators, more particularly incandescent lamps and electric-discharge tubes." Quarzlampen Ges. September 7th, 1936. (502023.)

24540. "Mosaic electrodes for electronic scanning devices." W. Heimann. September 10th, 1936. (502024.)

24575. "Electrical apparatus in solid compound filled chambers." English Electric Co., Ltd., and W. E. Senhenn. September 9th, 1937. (501847.)

24643. "Lanterns for electric lamps." British Thomson-Houston Co., Ltd., and E. B. Tuppen. September 9th, 1937. (502150.)

24644. "Illuminating systems for optical-projection apparatus." British Thomson-Houston Co., Ltd., and G. S. C. Lucas and S. R. Eade. September 9th, 1937. (502038.)

24649. "Electric condensers." A. H. Hunt, Ltd., and J. H. Fisher. September 9th, 1937. (502039.)

24651. "Electrolytic condensers and method of making the same." A. H. Hunt (Solar Mfg. Corpn.). September 9th, 1937. (501985.)

24708. "Apparatus for controlling the interconnection of two three-phase electrical systems." A. Reyrolle & Co., Ltd. (Allis-Chalmers Mfg. Co.). September 10th, 1937. (502151.)

24722. "Picture transmission television and the like." Standard Telephones & Cables, Ltd., and V. J. Terry. September 10th, 1937. (502098.)

24723. "Teleprinter apparatus." Creed & Co., Ltd., and R. D. Salmon. September 10th, 1937. (Addition to 460447.) (502099.)

24738. "Magnetic electron lens systems for cathode-ray devices." British Thomson-Houston Co., Ltd. September 11th, 1936. (501931.)

24739. "Electric-discharge vessels and processes for the production thereof." Siemens & Halske Akt. Ges. September 10th, 1936. (502101.)

24777. "Electron-discharge devices." O. Klemperer. September 11th, 1937. (502104.)

24851. "Electric incandescent lamps." Siemens Electric Lamps & Supplies, Ltd., and J. N. Aldington. September 13th, 1937. (502042.)

24871. "Electrocardiograph." E. T. Both. September 13th, 1937. (502043.)

25180. "Electrical installation." W. W. Groves (I. G. Farbenindustrie Akt. Ges.). September 16th, 1937. (502046.)

25293. "Electric cables." Standard Telephones & Cables, Ltd. (H. Sonnenfeld). September 17th, 1937. (501850.)

25354. "Automatic tuning in radio receivers." E. K. Cole, Ltd., and A. W. Martin. September 18th, 1937. (501934.)

25384. "Electric time switches." A. H. Harlow. September 18th, 1937. (501935.)

26847. "Reversing-switches with a no-volt release." P. J. Branchu and Soc. Francaise Gardy. October 4th, 1937. (501937.)

28461. "Electric cables having shielded conductors." Standard Telephones & Cables, Ltd. (Western Electric Co., Inc.). October 19th, 1937. (Convention date not granted.) (502122.)

29982. "Illuminating means for the transmission of television and the like." General Electric Co., Ltd., and D. C. Espley. November 2nd, 1937. (502051.)

31148. "High-pressure mercury-vapour electric-discharge lamps." General Electric Co., Ltd., and V. J. Francis. November 12th, 1937. (501854.)

31211. "Thermally operated tripping devices for use in connection with automatic circuit-breakers and similar electrical switchgear." J. A. Crabtree & Co., Ltd. (Schiele Industriewerke). November 13th, 1937. (502052.)

31952. "Electrical heating element and method of manufacturing same." Naamlooze Vennootschap Molybdenum Co. November 20th, 1936. (501942.)

34520. "Transmitting stations for distant control systems." E. Granat and Compagnie des Forges et Acieries de La Marine et d'Homecourt. December 31st, 1936. (501858.)

34956. "Magnetrons and other thermionic tubes." Ideal Werke Akt. Ges. für Drahtlose Telephonie. December 17th, 1936. (501859.)

35298. "Self-generating gas-blast electric switches." British Thomson-Houston Co., Ltd. December 21st, 1936. (502129.)

1938

1495. "Lifting magnets." S. Rovig. January 23rd, 1937. (502131.)

9042. "Electric-discharge tubes with metal envelopes." Egyesult Izzolampa es Villamoss-Agi R.T. March 25th, 1937. (501869.)

11506. "Electrical instrument for measuring pressures." Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. April 20th, 1937. (Cognate application 11507/38.) (501872.)

13277. "Zinc containers for dry battery elements and process for making same." K. Baumgarten. May 4th, 1938. (502062.)

13756. "Incandescent electric lamp." Singer Manufacturing Co. May 7th, 1937. (501956.)

13782. "Method and apparatus for treating substances with electric discharges to facilitate chemical reactions therein." J. E. Nyrop. May 7th, 1937. (502063.)

14069. "Vibratory electric motor apparatus." Clipshave, Inc. June 19th, 1937. (501957.)

15219. "X-ray apparatus.' Naamlooze Vennootschap Philips' Gloeilampenfabrieken. May 24th, 1937. (502000.)

16543. "High-pressure metal-vapour electric-discharge lamps." British Thomson-Houston Co., Ltd., and General Electric Co., Ltd. June 4th, 1937. (501881.)

18530. "Thermally tripped automatic circuit-breakers and similar electrical switchgear." J. A. Crabtree & Co., Ltd. (Schiele Industriewerke). November 11th, 1937. (Divided out of 30943/37.) (501885.)

19686. "Filling and venting devices for electric accumulators." Chloride Electrical Storage Co., Ltd., and H. Dean. July 2nd, 1938. (502066.)

20194. "Rectifiers for ultra-short waves." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. July 10th, 1937. (501890.)

20291. "Television receiving apparatus." C. Lorenz, Akt. Ges. July 23rd, 1937. (501891.)

20746. "Electron-discharge apparatus." Electrical Research Products, Inc. August 31st, 1937. (502005.)

20923. "Voltage-regulating equipment." British Thomson-Houston Co., Ltd. July 14th, 1937. (501893.)

20936. "Navigation-aiding radiotransmitters." Marconi's Wireless Telegraph Co., Ltd. August 18th, 1937. (501894.)

21090. "Apparatus for the production of electrically welded tubes from metal strip." Power Flexible Tubing Co., Ltd. June 13th, 1938. (501959.)

22946. "Electric lamp sockets." Birdeye Electric Corporation. August 11th, 1937. (501899.)

23606. "Sources of light comprising a high-pressure mercury-vapour electric-discharge device." British Thomson-Houston Co., Ltd., and General Electric Co., Ltd. September 11th, 1937. (501901.)

24240/1. "Electrocardiograph." E. T. Both. September 13th, 1937. (Divided out of 502043.) (502072/3.)

26386. "Means for supporting piezo-electric vibrating elements." Standard Telephones & Cables, Ltd. October 30th, 1937. (Addition to 480666.) (502075.)

27305. "Venting devices for alkaline accumulator cells." Chloride Electrical Storage Co., Ltd. September 17th, 1937. (501906.)

34494. "Gas-filled electric incandescent lamps." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. November 29th, 1937. (502078.)

TRADE MARK APPLICATIONS

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from March 29th :—

Birlec. No. 603,689. Class 9 (IV).—Electric circuit-breakers, electric meters, switchboards, transformers, thermo-couples and pyrometric and thermostatic instruments and regulators.—Birmingham Electric Furnaces, Birlec Works, Tyburn Road, Erdington, Birmingham.

ON (lettering and design). No. 603,779. Class 9 (IV).—Electrical apparatus and instruments, etc.—F. Darton & Co., Ltd., 56-56a, Clerkenwell Road, E.C.1.

TCL (lettering and design). No. 603,919. Class 9 (IV).—Electrical control apparatus.—Teddington Controls, Ltd., Teddington Works, Windmill Road, Sunbury-on-Thames.

Safety First

The National "Safety First" Association held its annual Industrial Safety Conference at Balliol College, Oxford, from March 24th to 26th, when the following papers were read:—"Some Details Concerning Access to Plant," by J. McKillop and G. P. Kingham; "Psychological Factors in Accident Causation," by C. A. Oakley; "The Safe Use of Solvents," by F. W. Clark; and "The Foreman's View of Safety," by K. N. Harris.

CONTRACT INFORMATION

Particulars of work for which tenders are invited, contracts placed, and building schemes promising work for electrical contractors and traders

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses. Further details of items marked with an asterisk can be obtained from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Aberdeen.—April 12th. County Council. Electrical work at new police station at Kincardine O'Neil. County Clerk.

Australia.—BRISBANE.—April 21st. Electricity Supply Department. 11,000-V metal-clad switchboards. (T.Y. 20076/39.)*

MELBOURNE.—May 16th. Magnetic submarine telephone cable. (T. 20360/39.)*

May 9th. State Electricity Commission of Victoria. Electrical dust-precipitation plant. (See this issue.)

TASMANIA.—June 12th. Electricity Department. Terminal station switchboard, one motor-generator set, auto-transformers and high- and low-voltage underground cables. (T. 20437/39.)*

Birkenhead.—April 18th. Electricity Department. Stores and materials for twelve months. (March 31st.)

Birmingham. — April 14th. Electric Supply Department. One seven-panel, 11,000-V, extra-high-voltage metal-clad switchboard. (March 24th.)

Bootle.—April 17th. Watch Committee. Sodium electric lighting at Aintree Road and sodium lighting equipment comprising lamps, lanterns, control boxes, time switches, poles, brackets and conductors. (See this issue.)

Brecknockshire.—April 13th. Standing Joint Committee. Installation of electric lighting in Defynock police station. H. Strickland, county architect.

April 12th. Electric lighting and power installation at Brecon Isolation Hospital. County architect, County Offices, Brecon.

Bromley.—April 14th. Electricity Department. Single- and three-phase static transformers. (March 24th.)

Buckhaven and Methil (FIFE).—Town Council. Electrical work at new fire station at Methil. Schedules from burgh surveyor, Buckhaven (deposit £1 1s.).

Chester.—April 11th. City Council. Electric wiring installation at Blacon school. (March 24th.)

Chichester.—April 21st. City Council. Transformers for twelve months. (See this issue.)

Edinburgh. — April 12th. Scottish Special Housing Association, Ltd. 120 electric cookers and 120 electric washboilers for the housing scheme at Forth, Lanarkshire. Secretary, 73a, Shandwick Place.

Eire.—ENNISCORTHY.—April 18th. Electrical installation at the District Mental Hospital. C. B. Molony, resident medical superintendent.

Glasgow.—April 11th. Transport Department. Materials for a year, including v.i.r. cable, electrodes, &c. Town Clerk.

Halifax.—April 8th. Health Committee. Electrical work at new hospital operating theatre block. Town Clerk, Town Hall (deposit £1 1s.).

April 10th. Improvement Committee. One electric passenger lift. Town Clerk, Town Hall (deposit £1 1s.).

Mexborough.—April 7th. Electricity Department. Extra high- and low-voltage cables for twelve months. (March 24th.)

Middlesex.—April 22nd. County Council. One three-throw, vertical, single acting, reciprocating pump, coupled through gearing to an electric motor, with all necessary piping and valves. Engineer-in-charge, West Middlesex Main Drainage Works, Isleworth.

Morocco.—RABAT.—April 21st. Protectorate Post Office Authorities. Quantities of lead-covered telephone cables. (T. 20250/39.)*

Newark-on-Trent.—April 17th. Electricity Department. One 500-kVA outdoor type transformer, complete with on load tap changing equipment. (March 31st.)

Newcastle-on-Tyne.—April 24th. Tyne Improvement Commission. Eight 3/1½-ton and two 5/2½-ton electric travelling portal level luffing cranes, or alternatively, ten 3/1½-ton cranes, for the New Quay, North-West Corner, Tyne Dock. The chairman, Tyne Improvement Commission, Bewick Street (deposit £3 3s.).

Newcastle-under-Lyme. — May 12th. Highways Committee. Seventy-three street lighting lamps, lanterns, fittings and columns. (March 31st.)

Oldbury.—April 17th. Corporation. High-pressure electric-discharge lighting on the Birmingham-Wolverhampton Road between Hagley Road West and Birchfield Lane. (See this issue.)

Oldham.—April 17th. Electricity Committee. Painting with wood preservative of cooling towers at the Corporation generating stations. (See this issue.)

Portsmouth.—April 14th. Electricity Undertaking. One 15,000-kVA transformer at the generating station, Gunwharf Road. (March 31st.)

April 14th. 1,500 cooker control units and 2,000 switch fuses. (March 31st.)

April 17th. 33-kV cables. (See this issue.)

Rotherham.—April 24th. R.D.C. Electrical wiring installation in council houses. (See this issue.)

Scarborough.—April 8th. Electrically driven pumping machinery. T. E. Deamer, engineer and surveyor, U.D.C. Offices, Scalby (deposit £3 3s.).

Southport.—April 17th. Town Council. Two lifts. (March 31st.)

South Africa.—JOHANNESBURG.—April 15th. City Council. Two exhaust fans, complete with all associated equipment. (T. 20207/39.)*

April 12th. Extra-high-voltage cable end boxes. (T. 20213/39.)*

April 15th. One glass bulb mercury-arc rectifier unit complete with main transformer and all associated gear. (T. 20212/39.)*

April 19th. Three 380-V condensers. (T. 20524/39.)*

April 24th. Railways and Harbours Administration. Seven motor alternator sets. (T. 19896/39.)*

April 26th. Two petrol-electric mobile cranes for Port Elizabeth Harbour. (T. 19894/39.)*

April 26th. One two-ton electrically driven portal jib crane for Port Elizabeth Harbour. (T. 19893/39.)*

May 15th. Two electrically driven portal jib cranes for Port Elizabeth Harbour. (T. 20519/39.)*

May 4th. Union Tender and Supplies Board. Motor generator sets, switchboard and rectifier for the Central Telegraph Office, Pretoria. (T. 20390/39.)*

PAULPIETERSBURG. — May 1st. Town Board. Hydro-electric power plant, including water turbines, generators, switchgear and high-voltage line. (T. 20216/39.)*

Southern Rhodesia.—SALISBURY.—April 26th. Municipality. Steam accumulator installation and associated auxiliary equipment. (T. 20037/39.)*

April 26th. Two 5,000-kW turbo-alternators, condensing plants and associated auxiliary equipment, including water pumps, spray gear, main switchgear, transformer, &c. (T. 19887/39.)*

Stanley.—April 7th. Electricity Department. Cables, meters, lamps and wiring supplies. (March 24th.)

Tottenham.—April 25th. Transport and Cleansing Department. Magnetic separator. (March 31st.)

Warrington.—April 17th. Electricity and Transport Committee. Transformers. (March 31st.)

Orders Placed

Aberdeen.—Property and Works Committee. Accepted. Electrical work at houses at Insch.—W. Bisset. Wiring of two housing estates at Hatton.—Murray Mackie.

Angus.—County Council. Accepted. Electrical work for the reconstruction of Montrose Police Office (£353).—Bremner Bros.

Barrow-in-Furness. — Electricity Committee. Accepted. Testing equipment.—Ferranti. Two 100-kVA transformers and one 600-kVA transformer.—British Electric Transformer Co.

Birmingham.—Electric Supply Committee. Accepted for twelve months: Electric cooker control units and accessories.—Arrow Electric Switches. Aluminium saucepans and spare parts.—Hague & McKenzie. Electric kettles and spare parts.—Myall & Co. Electric storage water heaters and spare parts.—Berry's Electric. Electric wash boilers.—Burco. Electric water circulators and flanges and circulator control panels.—Santon. Large and medium size electric cookers and spare parts.—G.E.C. D.p. main switch fuses.—Berry's Electric; Revo Electric Co.

Accepted. Mobile cable testing equipment.—Ferranti. Circuit-breakers.—Ferguson, Pailin.

Bradford.—Gas Committee. Accepted. 10-HP electric motor for chemical works (£18).—B.T.H.

Health Committee. Accepted. X-ray equipment for St. Luke's Hospital (£1,805).—Victor X-ray Corporation.

Cardiff.—Electricity Committee. Accepted. 33-kV, 750,000-kVA metal-clad switchgear for the proposed No. 2 sub-station at the Roath power station, together with two further switches for the existing No. 1 33-kV sub-station (£39,315).—G.E.C. One 30,000-kW turbo-alternator complete with condensing plant and feed heaters (£117,913).—Met.-Vick. Electrical Co. Two 180,000 lb. per hour boilers together with auxiliaries, main flues and ash-handling plant, steam and water piping (£237,500).—Babcock & Wilcox.

Doncaster. — Doncaster and Mexborough Joint Hospital Board. Accepted. Electrical work in connection with extensions to the Isolation Hospital, Crookhill Road, Conisborough.—Bective Electrical Co.

Eston.—Electricity Committee. Accepted. Cables (£1,640).—Metropolitan Electric Cable & Construction Co.

Glasgow.—Electricity Committee. Accepted. 6,000-kVA transformers.—Bruce Peebles & Co.; British Electric Transformer Co.

Housing Committee. Accepted. Electrical installation in houses at Hillhouse and Balgraybank.—R. J. M'Intyre.

Halesowen.—Hayley Green Hospital Joint Board. Accepted. Electrical work at the hospital extensions (£2,932).—N. G. Bailey & Co.

Kent.—County Council. Accepted. Electrical work for new convalescent unit and wardmen's houses at Lenham Sanatorium.—Iverson Elecl. Co.

Lanarkshire. — Education Committee. Accepted. Electrical work at additions to Douglas Water primary schools (£355).—W. T. Prentice.

Middlesex.—Education Committee. Recommended. Electrical installation at technical college, Acton (£1,551).—Colston Electrical Co.

Newcastle-on-Tyne.—City Council. Accepted. High-voltage cable to be laid from the Manors Main sub-station to the Westgate sub-station (£1,245).—Henley's.

Salford.—Electricity Committee. Recommended. Switchgear (£1,452).—A. Reyrolle & Co.

York.—Electricity Committee. Recommended. Switchgear protective equipment.—A. Reyrolle & Co. (£5,119); Ellison (£238); Met.-Vick. Elecl. Co. (£35).

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdeen.—School, Tullos, for Corporation E.C.; city architect.

Aylesbury.—Factory, Haddenham Airport; D.R.P. Engines, Ltd., Horley, Surrey.

Barnsley.—Houses (176), Park House site; borough surveyor.

Bath.—Houses (44), Dolemeeds estate; borough engineer.

Battle (SUSSEX).—Fire engine stations, Broad Oak, Brede, Icklesham Village, Hurst Green and Broomhill, for R.D.C.; C. T. Chevallier, clerk, Council Offices, The Watch Oak.

Bilston.—Houses (24), St. Chad's estate; W. G. Lofthouse, architect, Town Hall.

Birmingham.—Airport Hotel, Coventry Road, Elmdon; C. Bryant & Sons, builders, Whitmore Road, Birmingham. Convalescent home, Lickey Hills (£50,000), for Birmingham Children's Hospital; H. F. Shrimpton, secretary. Factory and offices, Green Street; T. Elvins & Son, builders, Soho Hill. Premises, Bucklands End Road, for Birmingham Industrial Co-operative Society, Ltd.

Bradford. — Houses (78), Birksland Street; L. & W. Morrell.

Bristol.—Houses (158), Filwood Park estate, for B.C.; J. N. Meredith, city architect, Eagle House, Colston Avenue.

Cardiff.—Factory for Machine Products, Ltd., Pengam. Extensions to City Hall (£130,000); city engineer.

Carlisle.—Cubicle block at the Fever Hospital; city engineer, 18, Fisher Street.

Chelmsford.—Flats (56), London Road; Elizabeth Close Estates.

Cheltenham. — Houses (14), Naunton Way; Cheltenham Estates, Ltd. Fire station, Keynsham Road (£30,000); borough engineer. Hotel and shops, Pittville Street; Mars Commercial Properties, Ltd.

Clowne.—Houses (21), Mansfield Road, Creswell; M. Langrick, Creswell.

Cornwall.—Police station and houses, Penryn, for C.C.; S. Pool, county architect, County Hall, Truro.

Coventry. — Houses (36), Capmartin Road; A. H. Coltman & Sons, 143, Barker Butts Lane. Houses (34), Cecily Road; C. L. Smith, 4, Oughton Place, Highgate, Birmingham, 12. Houses (36), Ulverscroft Road and Mary Herbert Street; Gibson and Tamblin. Shops, Market Street and Smithford Street; D. E. E. Gibson, city architect, 1a, Warwick Road.

Crayford.—Large mills, for Vit-Bee, Ltd.; A. G. Porri, architect, 13, Great James Street, London, W.C.1.

Cumberland.—Alterations to Waverton Council school, for the C.C.; J. H. Haughan, architect, 4, Alfred Street North, Carlisle.

Derwent.—Houses (36), Barlby and Cliffe; G. C. Ferrey, surveyor, 12, Minster Yard, York.

Devonshire.—Enlargement of Grammar school, Barnstaple (£32,860), for the County E.C.

Dewsbury.—School, Temple Road, for E.C.; borough architect.

Durham.—Schools, Castletown and Ushaw Moor, for the C.C.; county architect, 34, Old Elvet. Additions to Leeholme Council school, for the C.C. (£4,300); Beadle and Chapman, builders, Bishop Auckland.

Ealing.—Factory and offices, Wadsworth Road, for Morny, Ltd.; Percy Bilton, Ltd., 113, Park Street, W.1.

Eastbourne.—Shop and flats, Cornfield Road; National Provincial Bank, Ltd.

Edinburgh. — School, Pilton housing area (£46,000); city architect.

Enfield.—Houses (12), Sarsfield Road; Bilton's Enfield Co., Ltd. Enlargement of County school (£34,092); W. J. Marston & Sons.

Eston.—Houses (90), South Bank U.D.C. surveyor.

Exeter.—Foundry and offices, Tan Lane, St. Thomas, for Garton & King, Ltd.; J. P. Sleeman & Sons, builders, New North Road, Exeter.

Falkirk.—Nurses' home (£40,000), for Falkirk and District Royal Infirmary managers; secretary.

Forfar.—Cinema, James Street, for A.B.C. Syndicate.

Garforth.—Houses (59), near Wakefield Road; Supreme Industries, Ltd. Houses (30), near Church Lane; D. Sherburn.

Glasgow.—Cinema, Pollok; Hamilton & Callendar. Additions to Bedford Picture House, Eglinton Street; H. J. Green.

Gosport.—Extensions to Town Hall (£20,000), for T.C.; borough surveyor.

Greenford.—Extensions to factory, for Aladdin Industries, Ltd., Aladdin Building.

Greenock.—Conversion of building into A.R.P. centre (£7,000) and provision of first-aid posts and depots (£10,000); secretary, A.R.P. Committee.

Halifax.—Library buildings, Pellon; D. T. Lloyd Jones, engineer, Crossley Street, Halifax.

Hetton.—Houses (75), for aged people, for the U.D.C.; A. H. Fennell, architect, Bridge End Chambers, Chester-le-Street.

Hinckley.—Extensions to factory, for C. Simpson & Co., Ltd., Rugby Road.

Huyton-with-Roby. — Houses (73), Jefferies Crescent; N. Hurstfield.

Ilford.—Houses (55), Somerville Road; J. T. Perrin. Houses (42), Stoneleigh Road; Hurstwell & Co. Factory, New North Road; R. Cramp & Sons.

Kenilworth.—Houses (48), Moorlands Avenue; G. E. Tisdale, builder, South Ways.

Kidsgrove.—Houses (20), Harrieshead Lane site; H. W. Crowther-Green, U.D.C. surveyor.

Kilsyth (STIRLINGSHIRE).—Swimming baths, recreation hall, drill court, &c. (£23,000), for Kilsyth T.C.; burgh surveyor.

Kingston-on-Thames. — Houses (110), Park Road, for T.C.; borough surveyor.

Leeds.—Dye works, Bradford-Wakefield Road, Bruntcliffe; Smith & Co., Ltd., Cliffe works, Bruntcliffe. Flats (884), Sweet Street, for T.C.; H. G. Dyke, builders, 14, Langham Place, London, W.1.

Leicester.—Central omnibus station, Burley's Lane (£24,312), for T.C.; G. Gurney & Son, builders, Vulcan Road.

Lichfield.—Houses (20), Swinfen, Packington and Shenstone; J. G. Rimand, R.D.C. surveyor.

Liverpool.—Thirteen shops, Liverpool Road, Rupert Farm estate, Huyton; T. Percy, White Lodge, Broad Green Road, Huyton. Factory, Long Lane, Fazackerley; Schweppes, Ltd.

London.—(ISLINGTON).—Additions and alterations to Town Hall, Upper Street, for B.C.; E. C. P. Monson, architect, Finsbury Pavement House, 120, Moorgate, E.C.2. (SOUTHWARK).—Shops and flats, 177-197, Old Kent Road; Wates, Ltd. Theatre, Tower Bridge Road; A. Mather, Leicester Chambers, Leicester Square, W.C.2. (STOKE NEWINGTON).—Homes for the aged, Green Lanes; L.C.C. architect, County Hall, Westminster Bridge Road, S.E.1. (WESTMINSTER).—Extensions to London School of Economics, Portugal Street; Governors.

Maidenhead.—Municipal offices and Council chamber, east side of Park Street, for T.C.; borough surveyor.

Manchester.—Works, Lyons Road and Tenax Road, Trafford Park, for Greigy Colour Co., Ltd.; B. Waterhouse, architect, 134, Deansgate. Additions to factory, Wythenshawe, for J. Crampton & Sons, Ltd., Altrincham Road, Wythenshawe; R. & T. Howarth, contractors, Crossfield works, Norwich Street, Rochdale. Extensions to factory of John Crampton & Co., Ltd., Altrincham Road.

Mansfield.—Houses (21), Mansfield Road, Creswell; M. Langrick, Mansfield Road, Creswell. Four shops and offices, Regent Street (£10,000); Waude Thompson, borough surveyor, Town Hall. Extensions to factory, Kirkland Avenue; Seal & Turner. Extensions to Mansfield & District General Hospital (£40,000).

Middlesex.—Remand home, St. Nicholas House, Hayes (£24,890), for the County E.C.

Newbury.—Houses (20), Southend, Cold Ash, for R.D.C.; E. G. Hampshire, R.D.C. surveyor.

Newcastle-on-Tyne. — Cinema, South Gosforth, for the Gillespie Cinema Co.; H. Wiles, architect, 24, Bideford Gardens, Low Fell, Gateshead-on-Tyne.

Newry.—Houses (92), for R.D.C.; W. B. Donoghue, clerk, Rural Council Offices.

Northampton.—Houses (24), Kingsway; A. Glenn & Sons, Ltd. Houses (22), Lovat Drive; Chowns, Ltd.

Nottingham.—Large premises, Listergate, for C. & A. Modes, Ltd.; W. Irwin & Co., Ltd., builders, Burley Street, Leeds.

Salford.—Enlargement of Newchurch Homes (£7,000); city engineer.

Sheffield.—Houses (30), Stumperlowe Crescent Road, Stumperlowe Close estate; E. Oxley (Contractors), Ltd., 11, Upper Hanover Street. Flats (44), Duke Street; W. Malthouse, Ltd. Houses (14), Hurlfield Road; Hancock Bros.

Shrewsbury.—School, near Copthorne Road; A. W. Ward, borough surveyor.

Slough.—Extensions to factory, for Starch Products, Ltd., near Middle Green Road.

Solihull.—Houses (104), near Shirley Railway Station, for U.D.C.; Councillor O. G. Grove, chairman of Housing Committee.

Stafford.—Houses (125), Silkmore estate, for T.C.; W. Plant, borough engineer, Borough Hall.

Stone.—Cinema, near Canal Bridge; Clifton Cinema Circuit, St. Phillip's Place, Birmingham.

Sunderland.—Houses (20), Mayfield Court; E. and J. Purvis, builders, Garcia Terrace. Houses (18), Priory Grove; Bell Brothers, builders, Newcastle Road.

Sutton Coldfield.—Houses (24), Bakers Lane; A. Walker & Son. Cafe, Powells Pool (£4,798); Streathers, Ltd.

Tottenham.—Flats, Arthur Street, and Allington estate, for B.C.; Rees J. Williams, borough engineer, Town Hall.

Upholland. — Cinema, The Dingle, Grove Road; Dickinson & Sons.

Urmston.—Houses (58), Croft Hall estate, Davyhulme; F. Entwistle, Barton Road, Davyhulme.

Uxbridge.—Houses (202), Manor Homes estate, Ickenham; Francis Jackson Developments, Ltd.

Wallasey.—R.C. school; F. X. Velards, architect.

Walsall.—Extensions to factory, Broadstone, Bloxwich, for T. Ross & Sons; Sanders & Proffitt, architects, Lichfield Street.

Warrington.—Cinema, Padgate Lane and Beresford Street; T. & S. Smith, Birtles Road, Orford.

Wealdstone.—Library, Grant Road (£26,761); Raglan Building Co., Ltd.

West Calder.—Works, for Scottish Oils, Ltd.

West Hartlepool.—Transport garage, workshops and offices, and club house, Civic Airport, Greatham, for T.C.; F. Durkin, borough engineer. Extensions to technical college (£31,350), for E.C.; borough surveyor.

Woking.—Maternity home, ward block and nursery (£30,000); R. O. Garrard, contractors, Rosemount Road, West Byfleet.

York.—Houses (30) and flats, Cemetery Road; Sorrell & Scaife, Ltd. Houses and flats, Groves area; city architect. School, Water Lane (£30,455); R. K. Poskitt, Ltd.

Yorkshire.—School, Rothwell, for the West Riding E.C.; F. Billerey, architect, 20, Grosvenor Place, London, S.W.1. School, Sedbergh, for the West Riding E.C.; A. J. Shoosmith, architect, 7, Gower Street, London, W.C.1.